



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



NAB

2

Ap 5

V. 4

HARVARD UNIVERSITY

Library  
of  
The School of  
Landscape Architecture













# APPALACHIA

THE JOURNAL OF

THE APPALACHIAN MOUNTAIN CLUB

VOL. IV

1884—1886



BOSTON

PUBLISHED BY THE CLUB

1886

May 10, 1926  
SCHOOL OF  
LANDSCAPE ARCHITECTURE  
HARVARD UNIVERSITY

3837

**Publishing Committee.**

THOMAS WENTWORTH HIGGINSON, *Chairman.*  
REST F. CURTIS, *Secretary.*  
SAMUEL ADAMS DRAKE.  
J. RAYNER EDMANDS.  
CHARLES E. FAY, *Editor of Appalachia.*  
GARDNER M. JONES, *Business Agent.*  
ROSEWELL B. LAWRENCE.  
MARIA ELLERY MacKAYE.  
EDWARD C. PICKERING.  
SAMUEL H. SCUDDER.

---

**Executive Committee.**

CHARLES E. FAY.                      SAMUEL H. SCUDDER.  
GARDNER M. JONES.

University Press :  
JOHN WILSON AND SON, CAMBRIDGE.

# CONTENTS.

---

## SPECIAL PAPERS.

	<i>Page</i>
<i>W. W. Bailey.</i> Recollections of the West Humboldt Mountains	151
<i>F. Blake.</i> Odometer measurements in the White Mountains	851
<i>A. A. Butler</i> Mt. Huntington . . . . .	40
The Tripyramid slides of 1885 . . . . .	177
<i>E. G. Chamberlain.</i> Altitudes in Massachusetts . . . . .	132
<i>F. H. Chapin.</i> Ascent of the Zinal Rothhorn . . . . .	97
<i>E. B. Cook.</i> Mts. Blue and Cushman . . . . .	84
The record of a day's walk . . . . .	54
<i>G. Davidson.</i> The first ascent of the volcano Makushin . . . . .	1
<i>W. M. Davis.</i> Earthquakes in New England . . . . .	190
Mountain meteorology . . . . .	225, 327
<i>J. R. Edmands.</i> A day on Flume Mountain and a night in the wilderness . . . . .	194
<i>C. E. Fay.</i> Was Chocorua the original Pigwacket Hill? . . . . .	822
<i>M. M. Hurd.</i> Ascent of the Matterhorn . . . . .	285
<i>R. B. Lawrence.</i> From the sources of the Connecticut to the Rangeley Lakes . . . . .	105
Middlesex Fells . . . . .	199
Camel's Rump and the Rangeley Lake moun- tains . . . . .	294
<i>G. C. Mann.</i> The excursions of our first decade . . . . .	353
<i>W. H. Peek.</i> An exploration of the Pilot Range . . . . .	219
<i>E. C. Pickering.</i> Accurate mountain heights . . . . .	215
Heights of the White Mountains . . . . .	305
<i>A. E. Scott.</i> A visit to Mitchell and Roan Mountains . . . . .	12
<i>S. H. Scudder.</i> The Alpine Club of Williamstown, Mass. . . . .	45
A winter excursion to Tuckerman's Ravine . . . . .	124
<i>W. H. Stone.</i> The flora of Mt. Monadnock . . . . .	145
<i>G. H. Wüherle.</i> An autumn visit to the Sourdnhunk Moun- tains and Katahdin . . . . .	20
<i>J. Worcester.</i> Humphrey's Ledge and its view . . . . .	130

ASCENTS, EXCURSIONS, AND EXPLORATIONS.		Page
<i>E. B. Cook.</i>	Speckled Mountain . . . . .	71
	Round Mountain . . . . .	257
	Excursion over Mts. Nancy, Anderson, and Lowell	262
<i>A. L. Goodrich.</i>	Notes of the region east of the Wild River and south of the Androscoggin . . . . .	261
<i>C. E. Hamlin.</i>	Notes on Ktaadn . . . . .	81
<i>G. Lanza.</i>	An ascent of Mt. Garfield . . . . .	265
<i>W. H. Peek.</i>	The Ice Gulch . . . . .	78
<i>Mrs. L. D. Pychowska.</i>	Crescent Mountain . . . . .	73
<i>Miss M. I. Stone.</i>	Mt. Watnomess and the Blue Ridge . . . . .	75

#### COMMUNICATIONS TO THE COUNCILLORS.

##### Natural History.

<i>C. E. Ridler.</i>	The flora of Willoughby Notch (July 14, 1884)	64
	List of plants found on Owl's Head (Canada), July 11, 1884 . . . . .	68
<i>M. V. B. Knox.</i>	Notes on the slide at Jefferson, N. H. . . . .	254

##### Improvements.

<i>E. B. Cook.</i>	New paths in Randolph, N. H. . . . .	86
<i>Miss M. I. Stone.</i>	Path to Georgianna Falls . . . . .	84
<i>W. G. Nowell.</i>	The Carter-Moriah Path . . . . .	269

#### COUNCILLOR'S REPORTS.

Natural History; by <i>C. E. Hamlin</i> . . . . .	64
G. C. Mann . . . . .	254
Topography; by <i>A. E. Burton</i> . . . . .	163, 256
Art; by <i>J. Worcester</i> . . . . .	69
Exploration; by <i>E. B. Cook</i> . . . . .	70, 164, 256
Improvements; by <i>Dr. W. B. Parker</i> . . . . .	82
I. Y. Chubbuck . . . . .	166, 267

#### BUSINESS OF THE CLUB.

Report of the Recording Secretary; by <i>R. B. Lawrence</i> . . . . .	154, 244
Corresponding Secretary; by <i>C. E. Fay</i> . . . . .	156, 246
Treasurer; by <i>C. W. Kennard</i> . . . . .	161
G. M. Jones . . . . .	251
Lists of Officers . . . . .	175, 283
Corporate Members . . . . .	95, 175, 283, 384
Corresponding Members . . . . .	175, 383
Honorary Members . . . . .	383
Proceedings of the Club . . . . .	87, 168, 273, 375

## CONTENTS.

v

### MISCELLANEOUS.

	Page
Bibliography . . . . .	58
Excursions of the Season of 1884 . . . . .	92
of 1885 . . . . .	280
Tenth Anniversary of the Appalachian Mountain Club . . . . .	362
INDEX . . . . .	387





## LIST OF ILLUSTRATIONS.

VOL. IV.

---

PLATE I. CHOCORUA PEAK FROM THE PIPER PATH.

II. MAP OF THE ISLAND OF UNALASKA AND THE VOLCANO  
MAKUSHIN.

III. THE ZINAL ROTHORN.

IV. VIEW FROM HUMPHREY'S LEDGE (LOOKING NORTH).

V. SKETCH MAP OF MIDDLESEX FELS.

VI. SKETCHES OF THE PILOT RANGE.







*Photographed by W. H. Pickering, Aug. 16, 1884.*

*The Heliotype Printing Company, Boston.*

CHOCORUA PEAK, from the Piper Path.





# APPALACHIA.

---

VOL. IV.      BOSTON, DECEMBER, 1884.      No. 1.

---

## **The First Ascent of the Volcano Makushin.**

BY GEORGE DAVIDSON.

Read October 8, 1884.

IN 1867 I was placed in charge of the Coast Survey party for the geographical reconnoissance of the coast of Alaska, with special reference to making a report on the geography of its seaboard, and its resources, characteristics, and value as an addition to the territory of the United States. The party was transported by the United States revenue steamer "Lincoln." In the course of our work we visited the island of Unalaska,<sup>1</sup> seeking for fishing-banks, gathering information, observing for latitude, longitude, and the magnetic elements, and making a rapid survey of the harbor of Illiouliouk.

The great volcano of Makúshin, called Ajagish by the natives, is the highest part of this large island of the Aleutian chain, and it is one of three points of volcanic eruption nearly in line, within a distance of sixty nautical miles. These points have given signs of activity within the last year, and have been noted as "living" for over a century.

There are about a dozen active volcanoes in the forty-five or fifty which mark the Aleutian chain and the penin-

<sup>1</sup> Grewingk says (p. 119): "Unalaska (Aleutisch, Nagu-an-alache = 'das ist Alachacha . . .')." "



sula of Alaska; but those just referred to are located as follows:—

1. The island of Akutan, lying close off the northeast part of Unalaska, has two peaks of living volcanoes, three miles apart, northeast and southwest of each other. I made a sketch of them in 1867, when the eastern one was smoking, and I was then informed by one of the Russian-American navigators that on the night of Sept. 1, 1852, he saw one or two eruptions from the northwest side of these two cones. Frequently fire and great noises issue from the eastern peak. I made its height 3,888 feet; the western peak is given as 3,332 feet by Tebenkoff. The eastern peak is thirty-three nautical miles E. N. E. from the volcano Makushin.

2. The volcano of Unalaska (Makushin) is on the north and western part of this large island, in lat.  $53^{\circ} 52.5$  and long.  $166^{\circ} 45'$ , both approximate. It lies almost west of the harbor of Illiouliouk, at the distance of twelve and a half nautical miles. Towards the N. W. the coast line is only four and a half nautical miles distant, with broken mountainous land all around it, and precipitous cliffs towards the shore. The high broken land towards the N. E. terminates at Cape Cheerful, eleven nautical miles distant, and this cape forms the N. W. part of Captain's Harbor, or Unalaska Bay. Immediately behind this cape is an extinct crater, about 2,500 feet above the sea, within a distance of from one and a half to three miles; in front of it is a magnificent waterfall, plunging into the sea. From our anchorage inside the low point two miles north of the village of Illiouliouk we could see the summit of the volcano Makushin; but Mt. Lincoln rose 1,800 feet high, just north of the line to the volcano, and cut off the lower approaches.

3. The volcanic island of St. John Bogoslov, usually called Bogoslov Island. On Tebenkoff it is placed in lat.  $53^{\circ} 51'$ , long.  $167^{\circ} 40'$ ; but the navigators of the Alaska Commercial Company place it (1883) in lat.  $53^{\circ} 58'$ , long.  $167^{\circ} 57'$ ; and Captain Healy, of the Revenue Marine, places it (1884) in lat.  $53^{\circ} 55'$  and long.  $168^{\circ}$ . It is therefore forty-four nautical miles nearly west of the volcano Makushin. It has been seen in frequent eruption since Captain Cook's time, as I have

reported in a recent paper to the Superintendent of the Coast Survey;<sup>1</sup> but since 1823 has shown no signs of eruption until 1883, when a new and much larger islet was raised from deep water to a height estimated at from 800 to 1,200 feet above the sea, and just to the northwest of the former volcanic island.

It is not necessary to enlarge upon these matters, or refer to the volcanoes on Umnak Island, to the southwest of Unalaska Island, or on Akun, to the northwest of Akutan Island; but as a possible matter of interest I gather from Greywink, Weniaminoff, and others the following facts of volcanic activity in this vicinity:—

1768. Makushin (Ajagish) and the other volcanoes active.

1790. Akutan smoking. Makushin in activity at intervals to 1792.

1796. St. John Bogoslov reported to have risen from the sea; but it was seen by Cook in 1778, and Levasheff in 1768. Probably great changes took place in 1796.

1800. St. John Bogoslov was increasing in size from this date to 1815.

1802. Makushin in eruption, vomiting forth great fires; earthquakes; Bogoslov smoking.

1818. Makushin smoking; earthquakes.

1820. St. John Bogoslov smoking.

1826. Makushin smoking; two heavy earthquakes in June.

1830. Volcanic eruption at the southwest end of Umnak in August.

1838. Makushin and Akutan smoking.

1844. Makushin smoking weakly.

1852. Akutan, volcanic eruptions on the northwest side of Akutan, September. (Archimandritoff.)

1867. Makushin and Akutan smoking. Earthquake at Illioulouk in March. (Davidson.)

1883. St. John Bogoslov. The New Bogoslov rose to northwest of the old island. (Hague and Anderson to Davidson, 1883.)

1884. The New Bogoslov is covered with steam-jets, and is connected with Old Bogoslov by a gravel isthmus. New

<sup>1</sup> See also SCIENCE, Vol. III. p. 282. — Ed.

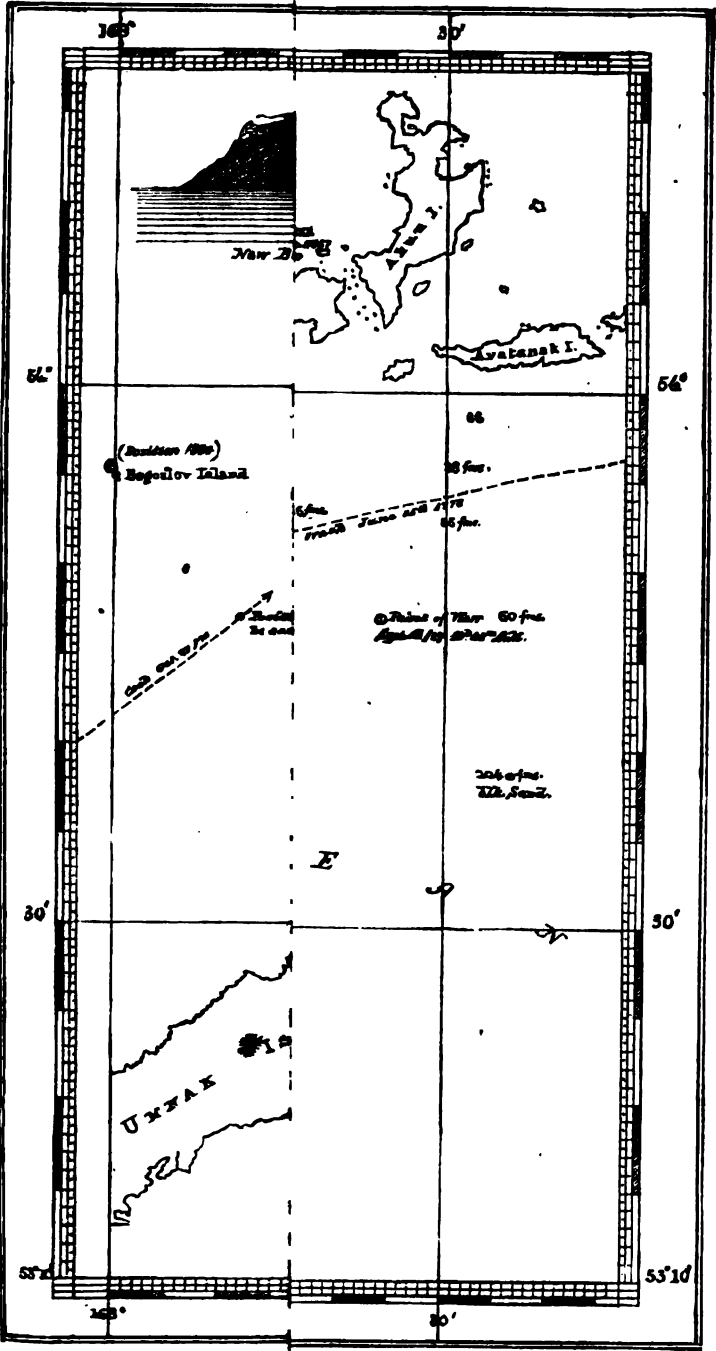
Bogoslov is about seven hundred feet above the sea. (Captain Healy, United States Revenue Marine; Lieutenant Doty to Davidson, 1884.)

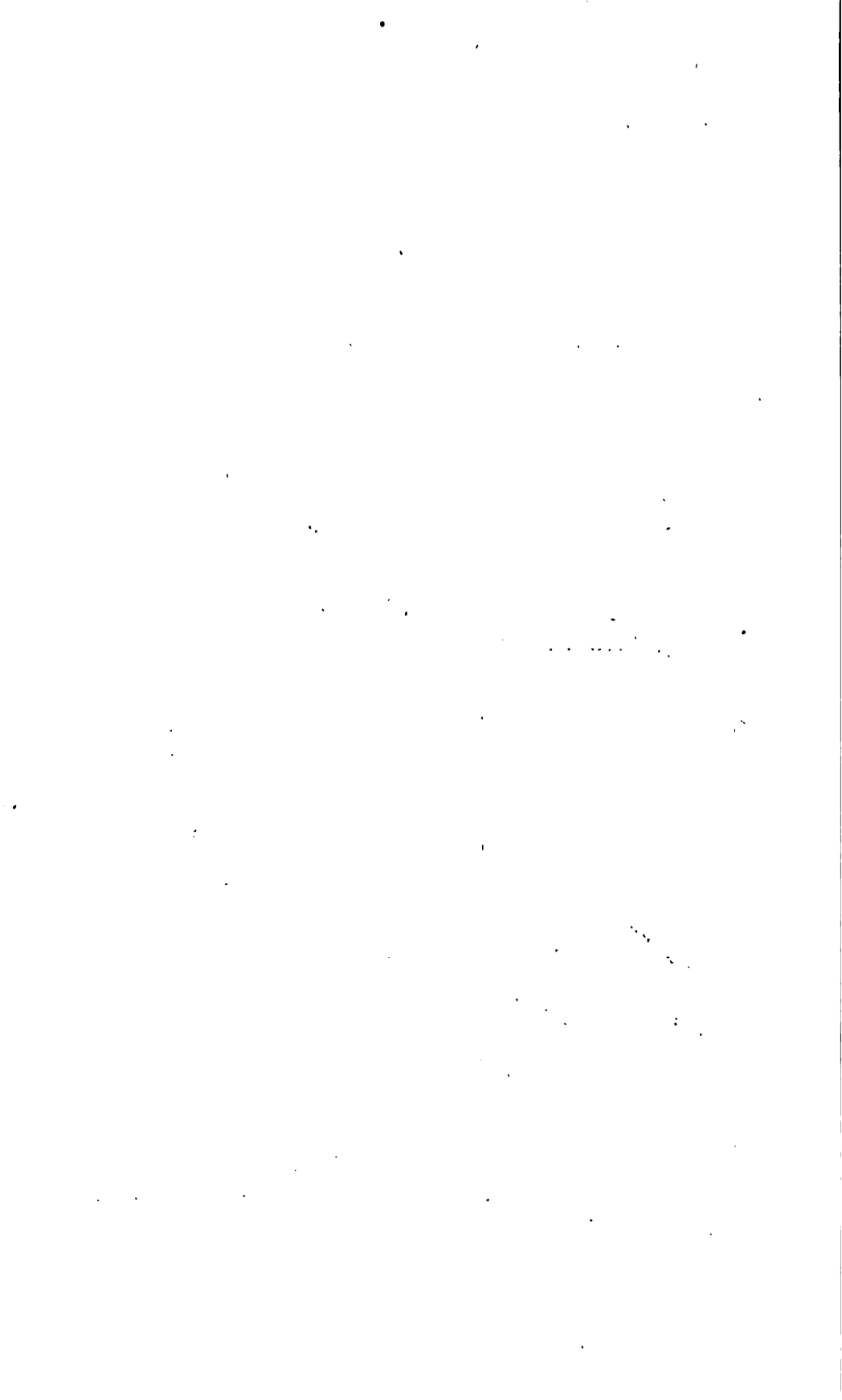
The height of the mountain Makushin is placed at 856 toises by Lütke; and various authorities give the height of the snow line, etc. In the middle of August, 1827, Lütke places it at 1,913 feet below the summit, or 8,546 feet above the sea; and Chamisso states it to be 5,485 feet above the sea, which is very nearly the total height of the volcano. Of course the height varies with the season and with different years. It will be seen, in the course of my narrative, that I place the height of the volcano at 5,691 feet, and the snow line on the eastern part, at the beginning of September, 3,105 feet, or 440 feet below Lütke.

Grewingk (p. 120) describes the mountain as follows: "The form of Makushin is almost a perfect cone, with the apex slightly cut off, and upon the surface of which (a snow-covered plateau) is a crater from which clouds of sulphurous smoke ascend. Upon the southwest side it falls sharply [to a saddle], and rises again in two peaks, of which the eastern is the higher." Weniaminoff says that it is not in the memory of man that the volcano emitted fire and flames, but from time to time are heard great subterranean noises; and in 1818 these were accompanied by a slight earthquake, when it appeared to the people as if great changes were taking place in the neighboring island Amachnak, in Unalaska Bay. Langsdorff speaks of an earthquake in 1802, during which the volcano burnt strongly, but the island of Bogoslov was quiet, except the hot geysers.

So far as I have read, I find no reference to the glacier which we first saw from Lincoln Harbor, and which the party ascended on their way to the volcanic peak.

I append a tracing from Tebenkoff's Atlas (Plate II.), showing the relation of the islands and the volcanoes. It is necessarily imperfect, but satisfactory in exhibiting the general relations referred to in the narrative. The position of the Bogoslov volcano has been determined (1884) by Captain Healy, of the United States Revenue Marine, from observations, and the new position has been given on the chart.





## EXTRACTS FROM MY DIARY.

Sept. 7, 1867. — Having yesterday organized a party for the ascent of the active volcano of Makushin, laid down on the imperfect charts as six and a half miles in a straight line from the opening of the glacier valley of the western part of Captain's Harbor, with an elevation of 5,474 feet, they started this morning from the ship at 9.30 o'clock. The party consisted of Theodore Blake, geologist; Dr. Albert Kellogg, botanist; Lieutenant Hodgson; Engineer Ball; and two seamen, Welsh and Penny. The party, with the outfit and provisions, was rowed to the village of Illiouliouk, where a guide and three packers were obtained. These natives accompanied the party, but the guide had never ascended the mountain. They were landed at the entrance of the valley opening upon the northwest side of Captain's Harbor in Unalaska Bay, about seven miles from Illiouliouk and twelve miles from our vessel.

This valley is a full mile wide at the entrance, quite flat, swampy, covered with very high, coarse grass and bushes, drained very poorly by a stream flowing from the base of the volcano, and receiving numerous rivulets from the transverse valleys and gullies that border and hem it in with their steep slopes of nearly half a mile in height. This valley rises very gradually, not over one hundred feet in the first four miles, but contracts rapidly. The walking through it was very tiring, as the wet, soft, yielding nature of the turfy bottom of *Sphagnum* and the heavy grass made it a dragging matter, especially to the leader. Dr. Kellogg was at once open to the botany, and seized every new plant or beautiful specimen of old acquaintance, while the others urged him to wait until they came back; but as he had his own load to pack, he felt equal to a few additional plants, and wisely secured the treasures, shrewdly guessing that the return home would be hurried, even with five days' provisions. The three aneroid barometers, which had been compared with the mercurial standard, and the three thermometers were read every hour. This afforded all a welcome breathing-spell.

At 5.30 P. M., after ascending a small slope at the head of the valley, they entered a ravine where the eight-foot  $\wedge$  tent was pitched for camping. Close by it was a beautiful little crystal stream, fed by the melting ice above. A fire was started from the roots of bushes, as not a tree exists on the whole island; small willows had been passed in the valley, but they were only from one to three feet high.

The hot coffee, hard-tack, and broiled salt pork were enjoyed with that keen relish obtained only by such a party, intent upon pleasure

when it is spiced by labor and the consciousness that no human foot has trod the summit of the volcano before them. The natives luxuriated in dried salmon and whale blubber. Some of our party tried these luxuries, but had not been reduced by hunger to appreciate their fine points. A matting of fern leaves eight inches deep was laid in the bottom of the tent, and made it really comfortable. The observations of the barometer made this station 472 feet above the sea. The day had been pleasant, with sunshine and high, fleecy clouds; but at half past seven the rains came down, and our tired travellers, who had been cramped for months on shipboard, wrapped themselves in their blankets and gladly sought sleep.

No less than nine persons were crowded into this small tent, including the four natives, about whose parasitical friends many grave suspicions were aroused. Sardines well packed were nothing compared to the "eternal fitness" of this crowd. It rained hard throughout the night, with strong gusts of wind; and the unnatural positions and discomfort of the party allowed little chance for sleep or fresh air. So they turned out at daylight, prepared and despatched a hasty breakfast, packed up their bundles and tent, and at seven o'clock commenced the ascent of the hill immediately over their tent. The ascent was sharp, for at eight o'clock they had risen to 1,278 feet above the sea. The hardest part of the route had been crawled along the sharp edge of a ridge formed by two ravines. When once this hill was gained, the view beneath and around was grand. Eternal snow covered Makushin; extinct volcanoes showed their red tops and furrowed lava-sides on either hand; and the valley the party had ascended was marked by the silver thread bearing icy water to the Bering Sea. Thence the ascent was over alternating small peaks and valleys, gaining an additional elevation of only 180 feet by nine o'clock, at which level snow was found in patches. At 9.30 A.M. they reached the base of a very steep mountain, which we afterwards saw from the vessel, — its almost perpendicular, black, scarred front looking like a great fortress on the outer flank of the snow-covered mountains. At its base the herbage was removed, and the earth at six inches below the surface was so hot that no one could bear his hands in it. The surface was cool; but, curiously enough, no one thought of observing the temperatures.

This extinct volcano is shaped like the frustum of a cone; it is composed wholly of volcanic matter, and within recent years was in active eruption. The area of the top, which is composed of lava, scoria, and ashes, is about two acres.

At ten o'clock its summit was reached, and the elevation determined

to be 1,927 feet above the sea. The station of 8 A. M. was seen about one and a half miles distant, and bore N. by E., magnetic.

After lunching, the party made a small descent of 172 feet, being the farthest point the guide had ever reached; so from here our people had to rely upon their own resources and judgment for success. The course now lay along the sides of steep mountains and steeper ravines, into whose deep chasms the loosened rocks would bound and rebound until lost with a dull, ominous sound that warned them of their fate if a misstep should befall them. Here they had evidence of the violence of Nature in rifting mountains; the mighty forces from beneath having upheaved, split, and torn them into every conceivable distortion, — with tops broken to fragments, sides marked by the lodgment of detached masses, and the deeps below filled with the débris of a thousand years.

Several plateaus were passed over, between which were deep ravines cut by the snow and ice. Down one of these the party managed to descend, and then travelled on the perfectly hard snow that lay in it, until at noon they reached about the level of the lowest ice limit, being the foot of the glacier of Makushin, lying open to the Eastward (or Lincoln) Harbor, where the vessel was anchored. This was at an elevation of 1,969 feet. Here extensive moraines of lava and ashes were exhibited in furrows and ridges from six to thirty feet high, with side moraines. The width of this glacier was here about two thousand feet, and thirty feet thick, crossed by immense fissures, which we could see on a clear day from the ship, twelve miles distant. Along the north side of this glacier the party travelled, frequently impeded by fissures in the lava from three to five feet across, and from thirty to fifty feet deep.

At one o'clock, P. M., they were ascending along the glacier; and no vegetation was found to exist above the height they had reached, which was 2,528 feet above the sea. At two o'clock they had been travelling on the hard snow for two hundred yards, when the angle of inclination of the glacier surface was found to be by measurement at ten to twelve degrees, and the elevation 3,105 feet. At three o'clock the height was 3,287 feet, and at four they agreed to camp for the night, when after some search they found a small space of level lava protruding three feet above the snow. Clearing the ground of the débris, they pitched tent, and supped with gusto upon hard-tack and raw pork, devouring it with the whetted appetites of hungry but scientific wolves. No water was to be had; so each ate as much snow as he desired. The observed elevation of this camping station was 3,385 feet.



The day had been pleasant, but cloudy, with little wind. Makushin had been enveloped in clouds; and no one yet knew, from personal observation, whether it was an active volcano. It was agreed, before settling to their hard beds of lava, that in the morning all the *impedimenta* of the party should be left at this camp except life lines and provisions, and a push made for the crater. The night was very cold, the weather squally and accompanied by a fall of rain and snow; so that after a most uncomfortable night's rest, made somewhat solemn by the subterranean rumblings and an occasional rush, roar, and thunder of a bounding avalanche detached by rain and wind, at five o'clock<sup>1</sup> in the morning (September 9) the party was ready to move, after a light, uncooked, and hurried breakfast. The top of the mountain was plainly in sight, but over two thousand feet above them, with smoke issuing from the crater, which lies to the northwest of the main peak, while the smell of sulphurous vapors was very strong. At this point the native guide and packers protested against advancing; but they were compelled to accompany the party, not only as packers, but to render assistance in case of accident, — a not at all improbable incident, as the travelling was now along the snow ridge at an inclination of fifteen to seventeen degrees, where it was necessary to stamp a foot-hole, and feel secure before advancing another step. At six o'clock an elevation of 3,532 feet was reached, and the weather became squally with rain and snow. The hard work of climbing made the party unheedful of the cold, which was now nearly down to freezing. At seven o'clock the elevation attained was 4,379 feet, and one barometer had reached its limit of action. Up to this time all of them had agreed remarkably well. At 8 A.M. the party were ascending at an angle of inclination of twenty-five degrees, had reached an elevation of 4,955 feet, and were in the clouds. Soon after eight o'clock the second barometer failed to record.

At one point below a projecting mass of lava some of the party were hauled up by ropes. Here was the most dangerous part of the ascent; for, had any one lost his foothold, he would have been precipitated down the sharp incline into some profound chasms to the eastward. From this standpoint of lava the party enjoyed a grand spectacle. In the far distance, on the sea horizon (which was eighty miles away), lay an island, and at their feet were the tops of extinct volcanoes that had loomed up as great mountains before reaching the

<sup>1</sup> About the same time (half past five) Messrs. Mosman and Forney of my party were observing with the vertical circle double zenith distances of Makushin from the astronomical station, near the anchorage. From the vessel the summit was visible for only half an hour.

levels of their summits, but were now relatively dwarfed to hills. Into many craters their eyes were the first to look. Whence had shot forth flame and stream and ashes and scorix, now were beautiful lakes; where the mountain-sides had been covered with liquid lava and furrowed by molten torrents, now reposed broad lines of perpetual snow. To their vision all was sublime; to their minds it was food for deep and wondering reflection.

At nine o'clock the crater was discovered, shaped like an immense bowl, and about three hundred yards in diameter, with inner sloping sides composed of snow. The clouds rifted and opened for a few moments, and the smoke and vapors were seen issuing from an opening in the further side of the crater, directly in front of the party.

The elevation of the crater is 5,590 feet. Bordering it on the southern side is a steep cliff, up which the party ascended to catch a better glimpse of it; this was the summit of the mountain, and it is 5,691 feet above the ocean. For a few minutes the clouds broke away, and almost beneath the feet of the party lay the crater, rolling out volumes of smoke and yellow sulphurous vapors. It was bordered by treacherously overhanging snow, which some of the party proposed to reach and thus descend into it; but the clouds suddenly formed and shut out the spectacle. The opening in the crater whence the smoke and vapors were ejected was estimated to be one hundred yards in diameter, round, and sloping in like a cylindrical ring.

The party now rested for the clouds to dissipate, and employed their time in writing their names, the date of the ascent, the circumstances of their visit, etc.; this was placed in a bottle, and left upon the summit. The flag was secured to a staff carried up for that purpose, and left there. Lunch reconciled them to the clouds; but when that had been despatched, and the latter not only showed signs of persistence but changed to snow, they commenced the return. At this time the barometer stood at 23.68 inches, and the thermometer recorded 30°.5 Fahr.; and the distance in a direct line to the point of debarkation was estimated at eight miles.

So thick were the cloud and snow that it was impossible to see over ten feet ahead, and the descent became imperative while yet their tracks remained uncovered. In descending, a small detour was made to the right, passing close along the verge of the precipice, to obtain if possible a glimpse of the terrific chasms. But the dense cloud hid everything; and after some narrow escapes the party reached the snow limit (3,105 feet elevation) at three quarters past eleven, A. M., having stopped at their lava camp, made another meal off raw pork and hard-tack, and packed their tent and bedding. On the return

the two barometers that had ceased their actions at certain elevations recommenced their record at the same elevations, and all three worked smoothly together. When the party reached the glacier, the driving snow and clouds were so dense that they could see nothing. On the glacier it was raining without the fog. They attempted to reach the valley by a rapid descent through one of the ravines, but it was found impracticable on account of the numerous cascades and their great heights; so they had to reascend its steep side, and make a circuit around the ravines. At half past twelve, P. M., the ice-limit was reached (2,229 feet); this was firm, solid ice, and not in patches. At ten minutes past three the descent had been made to 1,589 feet, and at seven o'clock they reached the camping-ground of the first night. The thermometer stood at 46° Fahr. With the usual improvidence of the natives, the guide and packers had started with about half a supply of provisions; and the party, having generously shared with them, had now run short of bread. So, soon after seven o'clock, all hands turned in, tired out, and their hunger half appeased with uncooked "prog." It rained hard all night, but no one complained of sleeplessness.

*September 10.* — At half past five, A. M., with the thermometer at 54° Fahr., the party broke camp, ate all their provisions, and "made tracks" for the beach. At one o'clock in the afternoon they reached the bay shore, the tent was set up as a signal that they had arrived, and the lookout men stationed on Lincoln Mountain, 1,800 feet above the sea, immediately telegraphed the fact to the ship, when the cutter was sent with provisions to their relief. At the beach the boat found two Indians, previously sent by the factor at Illioulionk to await their arrival, with tea and plenty of dried salmon and whale blubber. The hot cup of tea was relished; but the other two articles were eaten under protest, even by very hungry and tired men. At three o'clock the cutter reached the shore, and brought the party to the vessel at 5 P. M.

*September 13.* — At 5 A. M. this morning, while the vessel was getting under way for Sitka and the Alexander Archipelago, I was called to see the magnificent display afforded by the volcano Makushin. The sun was not yet up; but there the mountain rose in a broad, grand mass, with snow covering the glacier, saddle, and peaks. The transverse crevasses in the glacier were well marked, the position of the crater well determined by the clouds of steam and sulphurous vapors, rising behind the low spine to the northern peak. Up the

valley followed by our exploring party of the 7th, was seen the foot of the incipient glacier, with the channels and furrows driven by its yearly encroachments. The bold, rugged mountains on either hand formed a fine middle ground; and the low divide of the island west of our anchorage, with its water-front, formed a good foreground, destitute of timber, it is true, but rising 1,800 feet so sharply to the right, and cut by ravines that played well their artistic part.

As the sun rose, the warm pink tints gave a glow that almost seemed to laugh at the cold experienced upon its icy flanks and top; while the increasing light gave form to the great volumes of steam that rolled out and cast long, dark shadows far over the smooth and rising area beyond. As the vessel steamed towards the entrance of Unalaska Bay, the broad entrance of the valley towards the volcano was opened; the extinct volcanoes forming Cape Cheerful rose 2,500 feet to their right, with their sides red and black with scorix and lava; while the well-marked, high cascade, like a silver band, ceaselessly plunges into Bering's Sea from the lake embosomed apparently just behind the precipitous front of the cape. Still more distinctly defined became the exact position of Makushin crater between the two peaks. The vast volumes of steam were so dense and cloudlike that the shadows on the white snow beyond were black and sharply edged. Every one enjoyed the scene except the observers measuring the angle of elevation of the mountain; for each heavy roll of the vessel taxed their equilibrium and equanimity. All lingered upon the beauty and grandeur of the scene, the blue sky flecked by a few cumuli, and the calm serenity of the weather. Bering Sea sent in a regular ground-swell from the northwest but the sharp, blue horizon was pleasant to the eye.

We made our adieus to Unalaska Bay as we passed under the high, frowning cliffs of Kaleghtha Cape, with its treacherous reef extending one third of a mile outside its pinnacle rock. The two volcanic peaks of Akutan, 3,888 and 3,332 feet high, and ten and twelve miles to the northeastward, were crowned with clouds, although we got peeps of ravines filled with snow and ice, and of the perpendicular walls guarding the eastern side of the Akutan Strait, through which the pilot was unwilling to pass on account of the strong current. So we steered S. E. by E. through the Straits of Unalga, and were once more on the Pacific. The clouds cleared away, the majestic peaks of the chain were visible far to the southwest and northeast, and I was enabled to make sketches of the magnificent pyramidal Peak of Destruction, on Unimak Island, and, later on, of the steep, conical volcano Shishalden, 9,000 feet high, and guarded by its lower neighbors.

## A Visit to Mitchell and Roan Mountains.

By A. E. SCOTT.

Read June 11, 1884.

THE papers that have been presented to the Club relating to Mitchell and Roan Mountains in North Carolina describe difficulties in reaching the region of these summits which have been largely diminished by railroads now in operation, so that a short paper from notes made on a recent trip may be of some value.

Until recently Mt. Mitchell was approached only by long and tedious rides by stage and in the saddle, over deplorable roads, and through regions where travel is fraught with discomfort. Notwithstanding these difficulties, the peak has for many years been largely visited, being reached from the mountain counties of Yancey and Mitchell on the north, and McDowell and Buncombe on the south.

The approach by the Western North Carolina Railroad, which runs through the mountains a few miles south of Mitchell, is very beautiful, and as regards the construction of the road, even wonderful. It reaches an elevation of 2,800 feet; and to do this by a grade feasible for ordinary traffic, much skilful engineering was required. Now it winds around the head of a ravine, runs for a mile or two on the sloping side, tunnels a projecting ledge, doubles upon itself and returns on the same slope a few hundred feet higher up; now it jumps across a chasm, and zig-zags up the mountain side, on the edge of precipices, through tunnel after tunnel, until at last the summit is reached. It was my fortune to be the only passenger in the rear car of the train for a full day, and the unobstructed view from the platform was full of enjoyment. The lesser mountains and foot-hills seem piled together in endless confusion, clad to their summits with hard-wood forests, with beautiful flowering shrubs appearing in every direction: azaleas of brilliant colors, — great masses of scarlet and orange, — long drooping spiræas, dark

acacias, evergreen Andromedas, the calycanthus and fringe tree of our gardens, with cornels and laurel in profusion.

As we approached the summit of the ridge, it was impossible to repress exclamations of surprise and delight as the great mountains on the westerly side came into view. There was no one on the train who could give me any reliable information; but I had no difficulty in placing the great monarchs, such as Black, Craggy, and Pisgah. The negro porter pointed out to me the streams running in opposite directions, — one on that side, as he said, into the Atlantic, and on this, into the Pacific. Exactly how it crossed the Rockies, he did not state. "And there," said he, proudly, "is Mt. Mitchell, I 'spect the highest point of land in this country."

A few miles west of the summit is a station called Black Mountain. While the train was making its usual stop I had time to interview the station-agent as to the way to get to the base of the mountain, claimed to be eight miles distant, and of making the ascent. He informed me that it would take three days, — that I must go in to the base the first day, ascend the mountain on the second, descend and come out on the third, — and that I should require a guide and two horses. It was only claimed to be eighteen miles to the top; and as my time was limited, I quietly resolved that I would do it in a day, or at least in a day and two or three hours which I could use before the train arrived on the following morning. I was without experience, and had not learned to make allowance for the delays and shiftlessness incident to the region. I contracted for the guide and horses, arranged to have them at the station on the arrival of the early freight-train in the morning, and went on to Asheville, happy that I had made such satisfactory arrangements with so little delay.

They are evidently not much accustomed to mountain climbs or early starts in Asheville. The freight train by which I was to reach Black Mountain station left at six o'clock. At nine o'clock in the evening I found that I must leave without breakfast, and, the fires being out and the cooks having retired, I could not be provided with lunch for my excursion. I was, however, supplied with a dozen crackers in a paper bag, and with this outfit I started. While

the train stopped at a station a few miles out, I was fortunate enough to obtain at a shanty a breakfast of bacon and pome, the usual food of the region.

On reaching my destination, the man with whom I had contracted for a guide and horses seemed surprised to see me. He had evidently made no effort to keep his part of the engagement. His horses had gone into the mountains for a load of logs, and he did n't know any one about there who would go to Black Mountain with me. He was very gracious, however; informed me I could find guides at the base, said he expected his horses back very soon, and promised to drive me in as soon as they returned. I waited patiently an hour; then, making further inquiry, I found that it was doubtful if the team arrived before noon, that the horses must then be fed, and that the only vehicle in the vicinity was a wood truck without springs. I slung my little pack over my shoulder, and disappeared in the forest in the direction of the Black Mountains.

For three or four miles the way was uninteresting,—a clayey road through tame woods; only now and then a cabin appeared, and occasionally a person on horseback,—usually a woman with the dipping-stick protruding from her mouth, or a girl striding a bag of corn. At length the Swannanoa is reached, a mountain stream flowing from the defiles of Mitchell; and at the head of the valley rises the Black Mountain group,—Clingman and “Tater-top” hiding the high peak. The Swannanoa flows rapidly over a rocky bed, lacking somewhat the clearness and coolness of White Mountain streams, but more beautiful in the dense foliage and flowering shrubs that line its banks. Sometimes the rhododendrons arch the stream for many rods; sometimes they rise hundreds of feet in great masses, covering with their beautiful leaves the precipices and steep banks.

As I was hastening up the rapidly narrowing valley I was accosted by a man of rather more than the average intelligence of the region. “Going in to the mountain, I suppose,” said he. “Me and my brother are regular guides, and I would like to go with you. Perhaps you have heard of me: my name is John Glass; and a good deal has been written

about us in papers and magazines in connection with these regions." I assured him that it was pleasant to have a companion on a mountain climb; and although I did not feel the need of a guide, I should be pleased to have him accompany me.

We soon arrived at his brother's house, — a house made of sawed lumber, and more pretentious than the log cabins of the region. The cracks between the rough boards were even battened, and it had several openings intended eventually for glass windows. The usual broad veranda stretched across the front, and huge stone chimneys stood outside at each end. Inside it was divided by a board partition into two rooms, and each room had outside doors opening front and back. The furniture consisted of a rude table and a few chairs, and the crockery and cooking utensils only partially filled a narrow shelf in one corner; but luxuriant vines were climbing all around it, immense trees shaded it, and the Swannanoa brawled in front only a few yards away.

Mr. Glass and his sister were called from the field, and preparations were at once made for dinner and for luncheon to take with us, over a fire of logs in the huge stone fireplace. Impatient to begin the climb, I suggested that we would not wait to have anything cooked; but there was not even a crust of bread in the house, and I was obliged to submit to the delay until the bacon and corn cake were served.

At three o'clock we were fairly started, and my impatience was soon dispelled by the charms of the great hard-wood forest through which we were passing. The path is wide, distinct, and easy; indeed, there is little need of a path, for the forest is open, nearly free from underbrush and fallen timber, and the ascent is so gradual that it seems more like a stroll in an immense wooded park than a mountain climb. After three or four hours' walking like this we came out upon an extended cleared plateau of many acres, evidently formerly cultivated, and where for many years a house of entertainment for visitors to the mountain was kept, of which the ruins are still to be seen. The sun was disappearing behind the distant mountains. It was an ideal dream-land, and we concluded to remain there until morning.

A shelter was rapidly built of boards from the ruins of the



house, a pile of logs and stumps was easily gathered for our fire, and we were soon enjoying a luxurious camp at an elevation of nearly 5,500 feet above the sea.

During the night we were aroused by violent thunder, the pouring of rain, and the pounding of hail upon our roof; but our shelter served us well, and we escaped with a slight wetting. In the morning we found our path thickly carpeted with the tips of the fir-branches, cut off by the hail, and the hail-stones collected by the bushel in the hollows.

From the plateau the path continues, by a succession of long level stretches and gradual ascents, through forests of fir and green pastures, to Clingman's Peak. As we approach the summit, the character of the trees changes somewhat, but they continue of large growth, and are nowhere stunted as upon the higher mountains of New England.

The summit of Clingman is not entirely clear, so that the view is not wholly satisfactory. The descent to the ridge extending to Mitchell is slight, and the walk across, upwards of two miles, is largely level, leading through a number of beautiful open fields. The ascent of the final peak is somewhat steeper than the rest; but the distance is short, and there is no place on the whole path that presents the slightest difficulty, or that would be called steep by an Appalachian. On the summit of Mitchell there is a large open space, so that a view can be obtained with little difficulty in every direction. It would be useless for me to describe the view in detail. Let me merely say it is very extended and very beautiful, and with the sunlight bathing the mountain sides, clad in the brilliant colors of the luxuriant spring foliage, it is a wonder-land; but it is lacking in deep gorges and stupendous cliffs, and nowhere approaches the grandeur of Adams or of Bond.

With an Appalachian companion I think I should have followed a ridge extending southwesterly around to Craggy, or in the other direction to the Pinnacle of the Blue Ridge, from either of which points I think the view must be superior to that from Mitchell. In descending, we left the path, and followed the shoulder stretching southerly from the plateau where we had camped.

The distance from the base to the summit of Mitchell is variously estimated at from ten to fifteen miles. It is certainly long, but on measurement I presume it will be found to be somewhat less than ten. I intended to go out from the mountain in the morning, and take the train for the West *via* Warm Springs. I supposed I might be somewhat stiff from my mountain tramp, and concluded I would ride out to the station. There was only one wagon in the neighborhood, and of that one of the tires was off and both shafts broken. My companion thought he might possibly get one of the neighbors to set the tire, and he would mend the shafts; or, that failing, he could get a wood truck which was on wheels, and take me out with a pair of horses. But he urged me so strongly to go out in the saddle that I finally yielded, though I did not feel that in my stiffened condition I should stride a horse very gracefully. He said he could get a nice saddle-horse that would take me out "right smart."

The train was due at the station at eight o'clock, and John thought we ought to start as early as six. Two hours to go seven miles seemed to me to be unnecessary time; but I thought it wise to interpose no objection, and said I would be ready. So he bade me good-night at his brother's door, promising to be on hand in the morning.

It was half past six when John appeared. There was no clock or timepiece of any kind in the neighborhood, and he had guessed at the time. Judge of my surprise to find that the fine saddle-horse I was to ride was a black mule. His ears went in every direction at my approach, and his apology for a tail switched ominously. I mounted; there was a stirrup on one side, and none on the other. The assembled family vigorously urged the animal to start, but shouting had no effect. A forcible application of a switch and boot-heels was finally successful.

I was to hitch the animal in the woods near the station, and John was to walk over later in the day and take him back. By constantly applying the switch, I kept the animal in a brisk walk on smooth ground; but he was sore-footed, continually stumbled, and in stony places would only move at a snail's pace. I could have walked to the

station in the time I had, without difficulty; and why I took that mule, I cannot now imagine. Walking, I should have had only myself to get along, but now I had to get the animal along also. I will not relate the details of that vexatious journey. Suffice it to say that I was, after all, doomed to use three days in an excursion to Black Mountain.

A day or two later I found myself at Johnson City, on the line of the East Tennessee and Georgia Railroad, contemplating an excursion to Roan Mountain. The distance from Johnson's to Roan Mountain station is twenty-six miles. The intervening scenery is beautiful, and for four miles through the Doe River Gorge, or Cañon, grand beyond description. The gorge is narrow, in places 1,500 feet deep, often with almost vertical walls. The railroad, which is sometimes called "the stem-winder," winds its way up this cañon, keeping about one hundred feet above the river, on shelves cut from the solid rock, through tunnels and over bridges, until at Roan Mountain station it has reached an elevation of upwards of 2,600 feet.

I was not in condition for a mountain climb; but I had been assured that Cloudland Hotel on the summit of Roan was always kept open, and on the railroad time-tables it was announced by a foot-note, "Carriages at Roan Mountain Station for Cloudland Hotel." Having in mind the comfortable ride up Mt. Washington by the carriage road, I had ventured to make the excursion. Judge of my chagrin on arriving at the station to find that the hotel had not been open for several years, that the road was not completed, and that there was only one road wagon in the neighborhood, and the springs of that were hopelessly broken! An accommodating railroad official offered me a horse and saddle; but every one said it was useless to attempt to ascend Roan and return in a day.

I was there from Massachusetts to make the ascent, and I was determined to do it. It was only twelve or thirteen miles to the summit, and I regretted my inability to walk, that I might be sure of accomplishing it, for my experience in the Black Mountains had taught me to distrust everything but my own legs; but necessity compelled me to accept the horse, and I started about eleven o'clock.

The road to the base is rough but delightful, following and frequently crossing the river by rocky fords. From the base to the summit a road is nearly completed, of easy grades, constructed by zig-zagging up the mountain side, over which it is expected to take parties to the summit in two or four horse wagons. It was a delightful stroll through the finest forest I ever saw, through a magnificent flower-garden, from base to summit. The day was perfect; the air was full of the fragrance from myriad blossoms. It was a delight to exist there, and I would not hasten. My steed was not ambitious. I occasionally forced him into a trot, but always regretted it. At last, when we reached the col between the principal summits, I was surprised to find that the sun was disappearing. I was nearly two miles from the top. I could not even return to the base before dark; besides, I had started for the top, and was determined to accomplish it. I hastily resolved not to attempt to return, and pressed on to the summit.

The Cloudland Hotel is a low picturesque building, rudely constructed, but sufficiently large to make a party of thirty or more comfortable. As I approached I saw the front door open, and heard pounding within; and as I rode up a workman appeared, surprised to be intruded upon at that late hour. He was there making shingles for repairing the house, and was to remain over night. He cordially invited me to share his rude fare. My horse was turned out upon the mountain to feed, and I was soon comfortable on a bed of shavings in front of the log fire.

The night was without adventure. The train for Johnson's did not start until three o'clock, and I had ample time in the morning to wander over the beautiful fields and to descend easily.

Roan Mountain, its views and its flora, have been described in the admirable papers of Professor Chickering, published in *APPALACHIA*,<sup>1</sup> and I will not attempt to enlarge upon his descriptions.

The view seems to be of the same general character as that from Mitchell, but perhaps more extended. To one familiar

<sup>1</sup> Vol. II. p. 277; Vol. III. p. 142.

with our New England mountains, it seems strange to find at the altitude of Mt. Washington beautiful pasture-lands of great extent, to hear the tinkling of the bells, and to see a thousand cattle roaming at large over the summits. The great clumps of rhododendrons dotting these pastures here and there, sometimes in patches acres in extent, make one easily imagine the blaze of glory that must appear in June.

It may seem strange that I have represented the ascent of mountains so much higher than Adams or Washington so free from difficulty or fatigue; but we must remember that the distances are long, giving a gradual rise, and that the points from which the ascents begin are at an altitude of perhaps 3,000 feet above the sea, or 1,000 feet higher than points from which the ascents of the White Mountains usually begin.

---

### **An Autumn Visit to the Sourdnahunk Mountains and Katahdin.**

BY GEORGE H. WITHERLE.

Read June 11, 1884.

It was on the afternoon of Sept. 12, 1883, that my wife and myself left Medway village to begin our autumn trip up the west branch of the Penobscot.<sup>1</sup> To avoid the rough water which makes the first part of the ascent very difficult, our canoes and baggage had been forwarded by team (under the charge of our guides, — the same who accompanied us the previous year, — Mr. Paul R. Peavey, of Patten, and his son Clarence) to the western end of Fowler's carry, a point about twelve miles distant. A somewhat rough ride, supplemented by a two-mile walk, brought us to the same point just before sunset. Here we found our tents pitched, and the remainder of daylight was busily occupied in completing our preparations for our first night in camp.

In the morning, after a short walk, we embarked on the glassy waters of Quakish Lake. Over the woods, with which

<sup>1</sup> See Map of Routes to Ktaadn, APPALACHIA, Vol. II. Plate IX.

its shores are thickly lined, are partial views of Katahdin and Jo-Merry Mountains. Having crossed the lake, we landed and walked by the drivers' path to the North Twin dam, while the guides took the canoes up the intervening rapids. The next mile of dead-water was easily traversed; but a fresh breeze met us on the North Twin Lake, fortunately dying away as we entered the broad Pamedumcook, and becoming calm as the morning, on Ambijejis.

We camped on a sandy beach, making our beds of brakes, in the lack of suitable boughs. The summits near the Katahdin Iron Works show to good advantage from the lower lakes, while from the upper ones are some of the finest views of Katahdin itself and the Sourdnahunk Mountains. This day, a slight mixture of smoke and haze in the air gave them an ashen tinge, but without obscuring their outlines.

The next day took us over the Ambijejis carry, the Pas-samagamet dead-water and carry, and across the beautiful Katepskonegan Lake. The weather was calm, hot, and summer-like, — the thermometer registering 77°, — the air of somewhat increasing haziness, yet but little detracting from the views of Katahdin and his companions. During the night the moon was blood red. In the morning the sky was overcast and the air thick with smoke from the forest fires near the coast. There was not a breath of wind, — not a sound on the river or in the woods; a stillness that was almost fearful prevailed.

The very low stage of water lengthened the carries and otherwise impeded our progress. We passed over the Pock-wockamus and Aboljocarmegus dead-waters, and camped at the foot of "Abol" Falls. A moderate rain of short duration somewhat cleared the air, and gave us a glimpse of the sun before he set. A Sabbath day's journey of two or three hours next took us across the carry and up river to the entrance of the Sourdnahunk stream. We camped on its eastern side, close to its point of junction with the Penobscot, in a young birch-growth, among surroundings more varied and beautiful than at any previous camp. High hills extended on each side of the river, and rose at a little distance across the stream, their woods lightly tinged with the first touches

of autumn colors. Just above us lay a little island, where a half-dead and strangely contorted old pine towered above the smaller growth. Beyond it, less than half a mile distant, the Sourdnehunk Falls rushed foaming over ledges, sending up little clouds of spray. A few rods up the stream, seen almost at the same glance, were other falls, running over polished granite; and the sounds of falling waters, from different quarters, mingled pleasantly with the ripple of the rapids near us. We passed most of the remainder of the day in the shade, on the smooth rocks near the falls; our only drawback the presence of a larger number of black flies than September is supposed to produce, supported by a few mosquitoes. It was hot and still; the sky softened by a light smoky haze, with occasional slow-moving clouds, threatening but not bringing showers,—in all but the changing foliage a perfect summer afternoon. The evening gave us brilliant moonlight, supplemented by Northern lights, which for a while formed a curious spiral near the zenith.

A moderate rain detained us in camp during Monday, but we were well repaid for our detention by the close of the day. The sun shone out briefly, and set between the hills at the head of the river valley; then dark, heavy clouds, with a red, fiery glow underneath, drove rapidly past, while others, light, fine, and thread-like, spread out above, at first straw-colored, afterwards a delicate gold, changing to pink overhead, fading away almost imperceptibly into the blue of the sky. The following day, September 18, gave us a clear, breezy morning. About nine o'clock, taking one tent, bedding, and some provisions, we started on the path leading up the Sourdnehunk. The stream was very rough, full of rapids and picturesque falls, its clear water an agreeable contrast to the darker Penobscot. A three-mile walk brought us to the first dam, around which the Sourdnehunk Mountains seem to spread in a grand semicircle. A little beyond we stopped for dinner at a large logging-camp, which bore traces of very recent occupation. Beyond this is a good "tote road," which after a while led us over the stream; this we crossed upon a tree which we felled. At half past four we reached the second dam, about a mile beyond the crossing, and nearly

nine miles from the river. We took possession of a good bark camp, large enough to accommodate comfortably half a dozen persons, a knowledge of the existence of which would have saved us some transportation.

Here the Sourdnhunk is true to what is said to be the meaning of its name, — "river running between mountains." We were enclosed in a deep valley. On the western side of the stream one rugged mountain rose abruptly from our camp, hiding the sun nearly three hours before he set. Across the stream to the northeast and east, three high summits were in full view, concealing him for an hour after he rose. As we intended to remain here several days, young Peavey returned to the river in the morning, for an additional supply of provisions, while we undertook to ascend the mountain at whose base we had camped.

This mountain is a prominent and very striking object from the lakes and the West Branch, — a truncated pyramid, with a slightly concave top, marked by a slide and a peculiar and very distinct white spot. On the map attached to Hubbard's "Woods and Lakes of Maine" it is designated "Double Top," and I presume it is the one referred to by Thoreau under the same name. Most persons of whom I inquired knew of no special name for it, nor, indeed, for any of the Sourdnhunk Mountains; a few called it by the common and from most points of view inappropriate name of "Peaked Mountain." Its striking appearance, and the fine prospect which it commands, entitle it to a better appellation than either.

It was evident that the more moderate northern slope would be easiest of ascent, but to reach it would require an additional mile or two of travel up the stream. The road again crossed over at the dam, and we did not know what the chance might be for recrossing; we therefore concluded to attempt the steep side near us. Being somewhat delayed, it was nine o'clock before we started. Spotting our track, we began to climb at once, over rough broken rocks of all sizes, thrown promiscuously together, giving very little chance for proper walking, and requiring almost as much exertion of the hands as of the feet. Frequently we were delayed by ledges,



perpendicular and projecting, a little too high to climb, which we were obliged to flank. Short slides were skirted, — bare to the bed rock, too steep and smooth to cling to. We were impeded by many scattering windfalls, and by one wide belt, which required almost constant use of the axe, and soon after by scrub, equally difficult to penetrate. At half past two we had reached a point about 1,900 feet above our camp, where there was room to hang on, and enjoy one of our few outlooks over the woods and mountains. But our upward view was limited, and presented nothing but scrub. The conclusion was forced upon us that we must abandon our attempt for the day. So, after a luncheon and a short rest, we turned back, and, moving with less exertion but more care, reached our camp at sunset.

Across the stream is the track of a large slide, coming from the depression between the two nearest summits. It is said at one time to have almost completely choked the Sourdnhunk stream. From our highest outlook we could not trace its entire course, but judged that it must give a comparatively unobstructed path a good part of the way towards one of the mountains. Accordingly at eight o'clock the next morning we all set out again, crossed the dam and commenced the ascent, now walking on the polished granite ledges, over which a shallow stream of the clearest water was running, then across stretches where coarse gravel and disintegrated rock spread over wide spaces, or from one side looking down into a rough chasm ploughed out fifty feet deep. As we advanced, our course gradually turned, hiding the dam, shutting us in between the mountains, though giving us some outlook over the country to the northwest. Finally, after proceeding two miles, with a long, ridge-like mountain on our right, and a rounder one on our left, the direct track ended, and a great A-shaped slide from the left met it nearly at right angles. We had seen this the previous day; but as a part of the way by which we ascended was then hidden, we had no idea that the two were connected. Leaving my wife and the elder guide here, the younger and myself climbed this part of the slide. Much of it was very steep and bare to the ledge. We attained its apex about half past eleven, did a little cutting

in the scrub above it, and reached the summit, about 250 feet higher, in half an hour.

We had feared this might be so much overgrown as to cut off the view, and were much pleased to find it just enough elevated above the scrub to give an unobstructed prospect in all directions, being a knob, a short ledgy ridge, rounded but not polished, about 2,300 feet above our camp, and 3,400 feet above the sea. It was a mild day, the thermometer marking 64° at 2 P. M., — the sky clear, but the air somewhat smoky, slightly obscuring distant views. Parts of Moosehead Lake, all of Chesuncook, Chamberlain, and Sourdnahunk Lakes, the valley of the stream, and the West Branch Lakes were visible, with the western side of Katahdin. Very few persons had ever preceded us here; we found a large copper cent upon which two had marked their names. We remained three hours on the summit, and enjoyed the remarkable slide leisurely on our return. The last part of our descent was made by a narrower and more obstructed branch of it, which, starting from a locality where the rocks and gravel have spread out more widely than elsewhere, and where a small scattering birch-growth gives some resemblance to a deserted clearing, reaches the stream below the main track.

At 8 A. M. the following day, Clarence and myself again left camp, to ascend the mountain next northerly from the last. We climbed the slide for an hour, to the tract from which the two branches diverged, and then struck off to the left through the woods. After crossing two brooks, we were somewhat troubled by windfalls, and found a large extent of angular and mossy rocks and ledges, with deep cavities, almost caverns, among them. Picking our way through the scrub without serious difficulty, we reached the top of the mountain about noon. It was of considerable area, slightly rounded, with many large rocks scattered over it, but the ledge not visible. Low scrub grew at intervals, in some places forming a complete mat not more than two or three inches thick. Ripe cranberries were abundant. The air was rather more obscured than on the previous day; the smoke hung low, giving the distant hills and lakes a curious aspect, — its upper surface defined by lines parallel to the

horizon, straight as if drawn by a ruler. The sky overhead was blue, the wind light and variable, and a few thin clouds moved lazily along. The temperature registered 56°.

After our rough walk it seemed the height of pleasure to sit and look over the intervening lowland to Katahdin, whose western side spread out before us at full length, its outlines and irregularities made distinct, and its sober browns slightly colored, by the warm afternoon sun. Though less grand than the eastern view, it has striking features. Pamola and a part of the crest appear over the table-land. The slopes of the central portion of the southwest side are moderate, but along the northern end are deep ravines and gorges, with high, rocky precipices, and a deeper and larger ravine near the southwestern spur.

Twice while taking our dinner and once on another part of the mountain, our attention was attracted by a singular noise near us, which we could not exactly locate. It resembled what would be produced by a large quantity of stiff and crumpled paper turned over and moved along slowly on a rough surface by a light breeze. We could only account for it as being caused by the action of the wind drawing through crevices among the rocks, upon some stiff and slender growth there; but I could not recall ever having observed a similar phenomenon.

We did not hear of any previous visitors to this summit, and saw no traces of any. It is about 75 feet higher than that which we ascended the previous day, and is the highest of the Sourdnehunk Mountains, with the exception of one, a mile or two farther north, which I judged to rise 100 feet or more above it. We started for our descent at three o'clock, and were much annoyed on the way by black flies.

Moonlight nights, always a desirable feature in camp life, added much to the pleasure of our stay here. The chilly air of the autumn evenings could not detain us all the time around our fire and under the comfortable shelter of our bark roof; but we would go out, and watch the light creeping down the side of the western mountain, until at last the moon rose over the eastern summits, making the woods and the shadows blacker by contrast.

Short walks and a leisurely enjoyment of the surroundings of our valley occupied the next day, and we accepted the urgent invitation of the occupants of Moore's camp, a mile and a half up the stream, to pass the night with them.

At half past seven, on the 23d, I started with the Peaveys and two men from the camp, for the top of the mountain, which we attempted to scale on the 19th. We crossed the stream on a fallen tree, and deeply grieved the pet cat which belonged here, by not permitting her to go with us. Our course, up the more moderate northern slope, was much easier than that taken on our previous trial, giving us, however, some steep climbs, and leading us through many scattering windfalls and some scrub. We reached the northern and highest summit at eleven o'clock. This is a small knob, about 2,050 feet above our camp and more than 3,100 feet above the sea. A narrow, uneven, rough, and scrubby ridge, a quarter of a mile long, falling off very abruptly on each side, connects it with the eastern peak, which is thirty or forty feet lower, and is a bare and angular ledge.

It was a calm and very sunny day, the temperature being 65° at 1 P. M. The air was still smoky, but less so than for some time previous; and though our elevation was lower than that of the other mountains, the general view was finer, a smaller part of the landscape being hidden by Katahdin. On one side, deep below us, we looked down into the Sourdna-hunk valley, dotted with many clumps of brightly colored trees. Opposite was another valley of nearly equal depth and abruptness. Beyond it another steep elevation, somewhat lower than that on which we stood, designated on Hubbard's Map as "Veto Mountain." The West Branch Lakes were all spread out before us; quite near us extended the entire length of Chesuncook, and beyond it, parts of Moosehead, gleaming in the sun. We remained on top four hours, and having descended again enjoyed the hospitality of our friends for the night. We left with them at half past six in the morning, when they went to their work on the dam, soon packed up our goods there, and moving very leisurely, examining falls and interesting points along the stream, which we omitted on our trip up, reached our camp-ground on the river at four o'clock.

A rainy night followed, clearing with a violent squall while we were breakfasting. Early in the afternoon we started up the river. We carried round the falls, and were much impeded on the two miles of dead-water above, and the rougher navigation beyond, by a high northwest wind that brought clouds and showers. We camped early on the northern side. While walking on the river-bank I had the good fortune to find a large meal-bag full of clothing and sundries, mostly in fair condition, probably from some boat upset higher up the stream during the previous spring.

At 9 A. M. on the 26th we crossed the river, and walked in the drivers' path to Ambajemacomas Falls, the guides taking up the canoes; but the obstacles to canoeing — a strong head-wind and rough and very low water — here appeared so great that we determined to leave them. Taking our tents, we continued on foot to Ripogenus carry, where we camped at half past four.

The night was the coldest we had yet experienced, — the thermometer standing at 30° at sunrise on the 27th, with a heavy white frost, — but a large fire of driftwood kept us comfortable. We walked across the pleasant three-mile carry to Ripogenus Lake, where we took dinner, after which I continued alone over the gravelly beach, two miles, to Chesuncook carry and to Chesuncook Lake. Only a small part of the lake is here in sight, with Big Spencer Mountain — Sabotawan — looking down upon it. Retracing my steps, after a ten minutes' stop, I enjoyed again the beautiful Ripogenus, with the views it affords of Katahdin and the Sourdnamunk Mountains; then returned to camp by the path near the river, leading through the well-known but wonderful gorge. The dry bed of the southern channel, — from which the water is now usually excluded by a dam, — with its irregular honey-combed rocks and ledges, impressed me as the roughest spot I had visited. We had hoped to pass another day here; but the morning was very threatening, and, being at an inconvenient distance from our supplies, we reluctantly concluded to return. We walked all the forenoon in the rain, and at noon arrived at our camp-ground of the 25th, where we passed the night.

On our way down river the next day, we took on board the provisions we had left at the mouth of the Sourdnahunk stream, and stopped for dinner at a much frequented camping-place, opposite to the mouth of "Abol" stream. On landing, a notice caught our eyes,—"Look out for cartridges; we have been burnt out of house and home." Burnt fragments of tents, blankets, clothing, and various camp equipments indicated a destructive fire. We learned afterwards—what we inferred at the time—that five sportsmen from Connecticut, who left Medway on the same day as ourselves, were the sufferers, and that the fire had occurred while they were all absent.

Taking our usual burdens at 3 P. M., we started in towards Katahdin. At ordinary stages of the water, canoes can easily go a short distance up "Abol" stream, to the beginning of the path. Now we could not even enter the stream, and searched some time before we found the path. It begins in a rather discouraging manner, leading up and down, over two short but very steep ridges. We felt some anxiety in regard to the length of the walk we might need to take before finding wood and water, and were proportionably relieved when after two hours we again came to the stream, and found abundance of good fuel near it. A cloudy evening followed a dull afternoon. At 1 A. M. I rose to replenish our fire. Everything was still, and very dark, except where the bright circle of firelight overhead showed fine snow-flakes sifting slowly down through the tree-tops that hung over us. More snow fell during the forenoon, mixed with rain; but later the clouds broke away, and October 1 brought us a clear morning, with a temperature of 28°. At half past seven we again set out up the winding path, through a large hard-wood growth, across several brooks, followed by a swampy tract. At nine we reached the foot of the great southwest slide, and wound our way some distance farther among the young birches with which its lower part is overgrown. Then we toiled slowly along the bare portion of the slide, most of which is gravel and loose rocks, very little being uncovered ledge. Leaving my wife and the elder Peavey part way up, Clarence and myself reached the head of the slide at quarter of eleven. The climb from this

point to the table-land was one of much discomfort. It occupied three quarters of an hour. The sun, shining directly on the mountain side, was just beginning to melt the snow, which hid the path, wet our feet, and chilled our hands, as we climbed and crept, somewhat at random, over and among the slippery rocks, or pulled ourselves up by the frosty scrub, which grew at intervals, — much care being required to avoid dangerous falls. Snow lay over the table-land, — being six inches deep in some of the hollows and little drifts, — but we could avoid most of it by walking on projecting rocks. About half past twelve we reached the western and highest summit. The sun was bright, and the wind moderate, with a temperature of 25°.

Many separate masses of clouds hung over the country to the northward, hiding portions of it; the intervening spaces shone out, colored with a deep blue, reflected from the sky. The clouds were but little higher than the mountain top, — their skirts almost touched us as they drifted slowly by, — giving an icy chill when they obscured the sun. The shady sides of the great basin were thoroughly plastered with snow, and presented a most wintry aspect. It was a relief to turn to the West Branch valley, and the warm brown of its woods, to its lakes spread out below us, with Chesuncook and Moosehead calm and seemingly basking in the sunshine. The eastern horizon was remarkably clear; many of the heights along the coast were undoubtedly visible, though, without an exact knowledge of their direction, hard to identify. Far in the west, dimly outlined, was the serrated top of Bigelow; nearer, the Spencer and Squaw Mountains and, apparently close at hand, the mountains which we had so recently explored. On the other side we saw our last year's acquaintances, the Traveller and Sugar Loaf, also Chase's Mountain, with Patten, like a child's box of toy houses, set up on a flat near it.

A few brief and hurried glances even on a fine day, not half knowing or realizing what is seen, will not enable one to take in and appreciate the view from Katahdin. Much less partial glimpses, through clouds and mist, in unfavorable light, and perhaps under circumstances of discomfort, as has fallen to the lot of many who have climbed it and recorded

their impressions. As is often the case with grand natural scenery, it needs to be studied, to be seen under varying lights and different aspects, before its vastness, wildness, and grandeur, and — what is more rarely mentioned — its beauty, can be fully realized. It is true, no doubt, as Theodore Winthrop writes, that "Katahdin's self is finer than what Katahdin sees," in the sense that it excels in height, roughness, abruptness, and majesty, any feature of the landscape which it commands. But no one who has that real love for such scenes which alone makes it worth while to seek them,—no one who longs to

" See the lovely and the wild  
Mingled in harmony on Nature's face,"

can visit Katahdin on a day of average fairness, and remain long enough to watch new points of interest brought out by changing lights and shadows, or old points put on new aspects, or can compare the varied impressions made by the changed relations of the sun, clouds, air, and seasons at different visits, and be reduced, as Winthrop intimates, to counting the lakes.

Our dinner of bread and canned meat, with a bottle of cold tea, was taken on the sunniest side of the topmost rocks. We remained two hours. Our descent from the table-land to the head of the slide was much easier than our ascent, the snow being mostly melted, and at six we were again in camp.

The morning of October 2 was still and threatening, with a temperature of 28°. Two hours took us back to the river, and at 3 P.M., soon after the beginning of a steady rain, we camped at the head of Pockwockamus carry. The next day was damp and foggy; and we remained there until the morning of the 4th, when we left in a squally north-wind.

Our passage over the Katepskonegan Lake would have made a striking picture. There were many clouds; but between them the sky was of the deepest blue, and the sun shone with dazzling brightness. The tops of Katahdin and the neighboring mountains were snowy, and sharply defined; but passing snow-squalls occasionally caught and partially obscured them. Around the lake the woods had a warm



touch of color. In the midst was the rough water, its general darkness heightened by scattered white caps, and tossed upon it were our two little canoes. A slight possibility of danger perhaps increased for ourselves the impressiveness of the scene.

On the Passamagamet dead-water we were overtaken by a thick and driving snow-squall; and our camp that night at the head of Ambijejis carry, though the temperature was not as low as on other occasions, was the most uncomfortable of our trip.

At 9.30 A. M., October 5, we embarked on Ambijejis Lake. On its northern shore we noticed a considerable mixture of Banks's pine among the tree-growth. After a rough passage we entered the long cove leading to Millinocket carry. Very shoal water was encountered; and at eleven o'clock, while yet far distant from the head of the cove, we were compelled to begin our tedious "sacking," which occupied us until half past four. This seemed to be a favorite spot for animals. Tracks of deer and caribou abounded, with an occasional moose track. In some places the mud was trodden up like the soil of a barn-yard. The carry afforded neither suitable ground, wood, nor water for camping; and the prospect seemed a little discouraging when in a cold and increasing wind, and with sunset approaching, we paddled out on Millinocket Lake. In half an hour we landed among some very large second-growth birches, where the roughness of the ground made it difficult to find a suitable place to pitch our tents. But after going through the unpleasantness of doing our camping-work by insufficient light, when our fire began to burn brightly and we were warmed and refreshed, things put on a different aspect, and we had no lack of comfort.

We were nearly out of flour, and hoped to cross the lake in the morning, and procure some from a crew who we supposed were building a dam at the outlet; but a strong north-wind made it imprudent to attempt the passage in our loaded canoes. So, young Peavey — a very skilful canoe-man, seeming almost a part of the canoe himself, whose delight was in running rapids, and in navigation which would be alarmingly perilous to any except the cool and clear-headed expert —

started alone. Soon after he left the wind increased in violence, and we could not avoid some anxiety on his account. We were relieved when, soon after sunset, the wind having died away, we heard his voice singing in the distance, and were soon gratified by his arrival with needed supplies.

On the forenoon of the 7th we crossed the beautiful Millinocket, — Lake of Many Islands. The violent squalls, which had been frequent for several days, were over. Scarcely a breath of wind stirred the trees, or rippled the polished surface of the water; and the air was much milder than recently, the temperature rising to 59°. The sun was bright and the sky cloudless, with a slight haze softening distant objects and taking away extreme sharpness of definition. We had a constant view of Katahdin, with his snowy top, somewhat less massive than as seen from the river above, but with a finer outline. Our passage was enlivened — if the expression is allowable — by an abundance of loons. One flock contained the unusual number of sixteen. At noon we reached the outlet. About a dozen men were at work on the dam, — the first persons whom we had met since we left the Sourdnahunk, thirteen days before. Here we found a few newspapers, giving us our only news from the outside world since we started from Medway.

At this place is an extensive clearing, near the centre of which we camped in an exposed but pleasant spot. Firewood was rather scanty. The night was clear and very still. Although a little cool at times, we were surprised in the morning to find that the thermometer had fallen to 24°, the lowest temperature we experienced. A few potatoes left outside of the tent were frozen solid, and water used for washing skimmed over with ice when left a few minutes in a basin. Clarence had walked to Fowler's, — about nine miles, — the previous afternoon, to obtain a team to haul our canoes and baggage over the "tote road." Leaving his father to attend to loading, my wife and myself started on foot, at half past nine. The road, which is nowhere far from the Millinocket stream, is quite level, and would be pleasant if it were not for a long piece of burnt woods, where the sun was much hotter than was agreeable. We enjoyed the cool shade beyond,

in which we took our dinner by the side of the stream, for the thermometer had now risen to 65°. Sooner than we expected, we came in sight of the clearing, and arrived at Fowler's at half past three.

Though our first greeting by the very eccentric woman who supplied the place of landlady — a character who ought to be immortalized — was not exactly of the nature of a welcome, we were well taken care of in the dilapidated house; but the change from sleeping in the open air, on boughs and brakes, to a feather-bed in a very confined room, was not agreeable.

The next morning, October 9, our guides ferried us across the stream, then took the empty canoes down river, while we rode about five miles in the team with our baggage, and walked the remainder of the way, taking our last dinner in the woods by the roadside. About two o'clock we again saw before us the little village of Medway, its long tannery, its school-house, its conspicuous hotel, and the remarkable high rounded island at the junction of the two branches of the Penobscot. Here we found numerous letters awaiting us, and here we bade good-by to our guides, who had again so faithfully performed the necessary hard work of our expedition and so zealously aided in carrying out our plans.

---

### **Mounts Blue and Cushman.**

BY EUGENE B. COOK.

ABOUT an hour and three quarters after the rising of the sun on the morning of September 26, the writer, accompanied by Mr. W. M. Sargent, the well-known guide, path-maker, and lover of mountain fastnesses, left the Russell House, at North Woodstock, with the intention of traversing Mts. Blue and Cushman. The day before being stormy, various routes were discussed, and the enthusiastic woodman had warmly commended a four-pound tent he had, that made camping out a luxury. As celerity of movement is

best attained with the minimum of *impedimenta*, and as the Moosilauke Mountain House and Merrill's, at the foot of the mountain, promised rest and refreshment, our luggage was reduced to a cardigan jacket, rations for four possible meals, and a keen-edged axe, wherewith my companion could make his mark, improve our outlooks, and be ready to cut firewood if it became advisable to camp out.

From the little rise of ground just back of Russell's, almost in a W. S. W. direction, can be seen<sup>1</sup> "Nameless Mountain;" and behind it the long line of Waternomee extending southward, — its greatest elevation appearing behind and a little to the right of "Nameless." To the right of Waternomee, and behind it, stands Mt. Jim; and to the right of Mt. Jim rises Mt. Blue, a part of Moosilauke appearing in the background between Jim and Blue. The map of this region is in a very inchoate state, Waternomee being sadly belittled in its extent, and the ridge which connects Mt. Blue with Moosilauke is given a wholly wrong situation. An examination of the State map will show how Baker's River flows out of Deer Lake, and makes such a rapid descent that it acquires sufficient velocity to flow upward six or more hundred feet and surmount the wrongly placed connecting ridge! Our path from Russell's started near the end of his barn, and crossing a field came out upon a road leading by Moosilauke Brook to Smith's farm, two and a third miles distant, where the North Woodstock path up Moosilauke begins. On the way along the road we made a slight detour, to visit the noted Agassiz Basins, and examine the remarkable disposition of the huge rocks and the obstructed course of the stream.

The lower part of the mountain path is very easy traveling, passing through open woods of birch, beech, and spruce, and crossing Moosilauke and Walker's Brooks. The way further along is most elaborately engineered, and frequent zigzags lead one up so gradually that the ascent is scarcely realized. The path first makes its way up the side of "Nameless Mountain;" and two miles and a half from Smith's is a camp where one might lodge comfortably, and where cool

<sup>1</sup> See Profile, page 76. — Ed.

water is ever flowing. This mountain might be considered a part of Watronomee, but it possesses sufficient individuality to merit a name of its own. From here the path goes along the side of Watronomee, and passes not many rods from its summit. My companion pointed out to me what he thought the most desirable route to the top, which would start from higher up on the Moosilauke Path than the point of departure now marked by a sign-board. From the side of Watronomee the way proceeds to the side of Mt. Jim, passing not far from its summit, thence leading to the depression between Mts. Jim and Blue, and from there following the side of Mt. Blue.

At noon we left the path and began the ascent of the crest of Mt. Blue, which required only fifteen minutes. The summit was found to be sparsely wooded with short, sturdy evergreens, and some birches. Extensive outlooks were obtainable in nearly every direction; but by sitting ten feet aloft in a tree-top, an unobstructed circular view was gained. The temperature stood at 50° Fahr., and the atmosphere was surpassingly clear. The grandest objects in the view were the Franconia Mountains, the Great Range, and the wide-extending glitter of Lake Winnepesaukee. The most distinctive features were the lower peak of Mt. Blue, Mts. Jim and Watronomee, majestic Moosilauke, near at hand, and the neighboring ravines. The height of Mt. Blue is given as 4,533 feet, and my aneroid gave a result only eighteen feet less.

On leaving the top of Mt. Blue, after a prolonged study of the scene, we directed our steps toward the path, which was soon reached, and on coming to a spring which dripped over a rock at the path-side, we sat down and enjoyed our mid-day repast. The half-mile to the top of Moosilauke was quickly traversed, and on our way we noticed the guide-board indicating the path down into the acute-angled Jobildunk Ravine, with its extended succession of fine cascades. A little below the top we were welcomed by two white-and-Maltese kittens, which gambolled about in the most friendly and frolicsome manner. At the summit we learned that the two sportive visitors had journeyed up the mountain, seven

miles away from home, following young Mr. Smith, who had been engaged to assist in cutting firewood for use next season at the Tip-Top House.

Two hours were spent upon Moosilauke, in enjoying the glorious view on all sides, and in studying the topography through the admirable profiles drawn by Professor E. C. Pickering and by Mr. H. D. Young,—seasoned with the clear and appreciative comments of our hostess. A record book was shown, in which Deer Lake is given an altitude of 4,166 feet, Mt. Blue set down at 4,533 feet, the col between Jim and Blue at 4,063 feet, Mt. Jim at 4,218 feet, and Mt. Waternomee at 4,096 feet.

One of the ways proposed for reaching Mt. Cushman was by following the ridge of Waternomee until it joins the slope of Cushman; but a view from Moosilauke showed that the long crest and downward slope of Waternomee and the long upward stretch of Cushman were too thickly wooded to promise any compensating outlooks. Moosilauke so overtops its neighbors, that it rather dwarfs and supersedes their distant views; their chief attraction lies in the views close at hand, and in the magnificent appearance of Moosilauke itself.

At about four o'clock we started down the carriage-road to Warren. Stretches of the telephone wire were found sagging so low that they were suggestive of the danger of nocturnal garroting. A very inviting rill was seen on the way down, marked by a sign-board bearing the inscription "Kio-sau-mo-le Spring." The water was found clear and cold, and not at all suggestive of the decoction of Indian roots set forth in its name. At a quarter after five, P. M., we entered Merrill's Mountain House, where we spent the night and were refreshed with an excellent supper, a good night's rest, and a strengthening breakfast.

Starting away a little after eight in the morning, our way was by a path which crosses Baker's River and joins the wood-road which leads to the steam-mill situated below the notch between Mts. Kineo and Cushman. At the mill a road was selected which seemed to lead most directly towards the top of Cushman. It did not continue very far up; so our course was soon through the woods, which were very free

from obstructions. The incline became a little steeper just before reaching the ridge which leads up from the Cushman-Kineo Notch. This ridge was followed, and two seeming tops of Cushman were crossed before the third veritable summit was attained. On the way up we had broken glimpses of Mt. Kineo and of a shoulder of Moosilauke.

It was about half past ten when the summit of Mt. Cushman was reached, and there a tree was marked with a deep blaze upon which our names and the date were inscribed, as well as the readings of the thermometer and barometer. The top is wooded with firs, spruces, and birches, which stand sufficiently apart to allow glimpses of Kineo, Moosilauke, and of some of the Franconia Mountains. My aneroid told of an elevation of 3,320 feet above the level of the sea, and the received height allows only six feet more.

From the top of Cushman our course was directed in a northeasterly direction toward the Elbow Ponds. A short distance below the crest, on our downward way, we found a very fine outlook, which embraced a view of Moosilauke, Kinsman, Cannon, the Notch, Lafayette, Lincoln, Liberty, Flume, and a grand view of Mt. Washington and the Great Range, — which appeared like the dome and roof of an immense mountain cathedral. The side of Mt. Cushman descended rapidly, and a long stretch of forest was to be crossed, which at times was illustrated with rather obtrusive woodcuts. After a while an inviting wood-road was struck and followed a long way. It seemed to be leading us too far to the eastward; but suddenly we came upon boggy ground, and soon emerged from the woods at the narrow strait which connects the two Elbow Ponds. Toward the east appeared Mts. Tecumseh and Fisher, across the southeasterly lake, which was framed in the most varied and gorgeous autumnal tints. The channel connecting these little lakes is perhaps not over thirty yards in length, and from four to six yards in width. The length of the northwesterly pond may be about half a mile, while the southeasterly one is longer. They lie somewhat over 1,300 feet above the ocean.

On the other side of the strait lay an inviting raft, which my companion soon secured by wading part-way over, and

availing himself of an attractive pole which drew the raft across. He suggested that instead of seeking the road which leads out to Woodstock, we should sail half a mile across the northwesterly lake and shorten our homeward way, by passing through the old deserted Mt. Cilley settlement, of which some of the clearings were visible on the eminence overlooking the further end of the lake. Accordingly, embarking on the raft, we essayed *polar navigation*. A favoring breeze and skilful manipulation of a well-balanced pole sped us over the lake, our craft making music in logarithmic cadences. The writer sat on a cosey seat, and looked at Cushman and Waternomee, five miles off, and upon Fisher and Tecumseh in the distance. At half past one we landed at the northern end of the lake, and started on our way towards the dip between the lower and higher tops of Mt. Cilley. At about two o'clock, having come to water, we stopped twenty minutes and lightened our lunch-baskets. On resuming our journey we soon came to a path which leads up to the cleared fields of the deserted settlement. Looking back, the lakes were to be seen, and Mt. Cushman far away beyond.

Not many years ago, it appears, there was a small, promising colony on the side of the then unnamed mountain; but before long the settlers began to feel lonesome in their secluded mountain home, and abandoned their isolated retreat. The old road remains, now covered with grass, and stone walls still mark the deserted fields. A conspicuous orchard of dead apple-trees of goodly size attracts one's attention. It seems that after the place was deserted, many head of cattle were turned loose to pasture *ad libitum*, and that they injured themselves by too freely indulging in the cider of the apples, so that total prohibition was secured by girdling the apple-trees.

Passing further along the old road, we came to the fallen remains of a schoolhouse, suggestive of the good intentions of the settlers. Not far from the schoolhouse, standing on the high pastures which the road crosses, one has a fine view of Kinsman, Pemigewasset, and the lesser kinsfolk of the range, of Cannon, the Notch, Lafayette, Lincoln, Liberty,



Flume, the Whale's Back,<sup>1</sup> Little Coolidge, Big Coolidge, Potash Mountain, Mt. Hitchcock, and Black, Loon, and Russell Mountains.

On looking at the western sky it was found to present a peculiar curdled appearance, indicative of the approach of rain. As the road from the abandoned settlement led out to the main road, a mile north of Woodstock, we kept a northeasterly course along the fields until we reached the woods lying between us and North Woodstock. Traversing the woods for a mile or more, we came upon a good "tote-road," which we followed for a distance of over two miles, to where it came near the side of Moosilauke Brook. At this point we crossed the brook and a narrow field, and were upon the road we had started out upon the morning before. The familiar way seemed short to the Russell House, which was reached at eight minutes past four; and about half an hour later gentle rain-drops began to patter upon the roof.

---

### Mount Huntington.

BY ALFORD A. BUTLER.

Read September 12, 1884.

IN the summer of 1884 an excellent camp was built on the summit of Mt. Osceola, at the expense of the Appalachian and other guests at Greeley's; and the writer was a member of the first party that spread their wraps beneath its bark roof, and enjoyed the comfort of its roaring camp-fire. From this elevation a field-glass reconnoissance was easily made of the modest summits of Huntington, and the plan of approach arranged. Huntington, as seen from Osceola, is a long, low mountain, extending, in the form of an irregular crescent, in a N. E. and S. W.<sup>2</sup> direction. The concave side of the crescent is toward the south, and it was from this side that we determined to make our ascent.

<sup>1</sup> Mr. Sargent informed me that "The Whale's Back" is the local name for the peak terminating the range, — standing south of Mt. Flume.

<sup>2</sup> Not N. W. and S. E., as on the State map.

On August 18 the writer and a guide, Mr. William E. Brown, of Campton, shouldered their luggage and left Waterville at 7.20 A.M., taking the path to the Greeley Ponds. The day was one of the warmest of the season; but the smoothness of the path, the shade of the forest, and the cheerful chatter of Mad River made the start a very pleasant one. The Flume Brook, two and a third miles distant, was crossed in fifty minutes, and then the ground was felt rising beneath our feet as we approached the water-shed of the Mad River Notch. About 9 A.M. the first of the Greeley Ponds was reached, — a small, shallow sheet of water, but large enough to afford an excellent view of Kancamagus, whose precipitous, forest-covered walls rise grandly above its brown, grass-skirted waters.

I was impressed here, as I have been before, with a striking characteristic, or family resemblance, which exists among the mountains surrounding the Waterville glen. In nearly every instance the mountain outline ascends at a gradual incline until it reaches the summit, then rounds abruptly, drops for a few hundred feet precipitously, or, at least, at a very steep incline, and then gently slopes again toward the lowlands. On Snow's Mountain the precipitous side of the summit is toward the north; on Kancamagus and Tecumseh, it is toward the south; while on Osceola it is toward the east. The proximity of the last two peaks makes the family likeness very striking. They are two brothers, standing back to back.

Between the Greeley Ponds, and a little to the west of the path, we drank at a mossy spring remarkable, even in this region of excellent water, for its delicious coolness and sweetness. Across the deep green mirror of the upper pond we caught our first glimpse of Huntington, a flat dome of blue above the dark green of the forest. About fifty rods north of the upper pond the path divides; that to the east being the Mt. Washington trail of twenty years ago, — still used as far as the Sawyer River settlements, — and that to the west, cut two years ago, leading to a surveyor's camp at the junction of the arms of the Hancock Branch. Following the latter path for about a mile brought us to its southerly arm.

Leaving the path here, we took to the bushes, following up the stream N. E., then N. N. E. into the slope between the eastern and western summits of Huntington. Less than a mile of rough walking, first in woods, then in the bed of the stream, brought us to a striking rock exposure, to what must be a very beautiful cascade when the water-courses are well filled. The brook bed is fifty-five or sixty feet wide, a broad sheet of gray granite, rising forty-five or fifty feet above us at a very steep incline, down which rush the clear waters of the brook in many diverging streams. But when we have surmounted this elevation we find a similar one behind it, then another, and another, and still another, until we have traversed fully one thousand feet of sharply inclined clean granite, down which the water, now slipping and sliding "in thin, wide sheets of crystal coolness," now momentarily lingering in amber-tinted pools, now breaking into silvery whiteness as it dashes down a more abrupt incline, flows toward the great East Branch. The extent and color of the granite exposure reminded us of that on Flume Brook in the Pemigewasset valley; and the resemblance became still more striking when, half-way up the exposure, we suddenly came upon a flume which looked like the small model after which its great Pemigewasset brother had been constructed. Although only about seventy-five feet long, five to seven feet wide, and ten or twelve feet deep, the perfect solidity, perpendicularity, and parallelism of its granite walls, and the unvarying straightness of its course, gave it a clean-cut beauty not surpassed by some flumes many times its size. A point of geological interest is the fact that this little flume is still in the process of construction, the erosion of the friable trap-dike which forms it being yet incomplete; while, starting from a fault just above it, the erosion of an extension of the same dike has begun another flume, now only three or four feet in depth, but promising at some distant day to be a straight, deep cut, some three hundred feet in length.

Leaving the cascades about 11 A. M., we climbed the bed of the brook for nearly a mile, and then took to the woods, our direction being a little west of north. About noon we reached a small plateau, enclosed on three sides by the steep

semicircular walls of the upper slopes of the mountain, covered with a rank growth of swamp vegetation, and presenting the appearance of having once been the bed of an ancient pond. Here, reclining on beds of luxuriant moss, we ate our lunches and decided upon our future course. The eastern summit, although judged to be slightly higher than the western, is the more densely wooded, and gave no promise whatever of an outlook; the western summit, as seen from Osceola, had a long line of precipitous ledges on the south, and from these we hoped good views might be obtained. So, keeping to the right of the ledges and taking a course for the col between the eastern and middle summits, we pushed forward through the thick underbrush which surrounds the table-land, clambered over the great moss-covered boulders which mark the base of the rocky walls of the swampy amphitheatre, and then slowly climbed, hand over hand, up the steep slope to the mountain's ridge. Here, after one and a quarter hours of climbing, we rested in a pleasant open forest of spruces, too thick to permit of any view and too large to climb. Walking over the middle summit proved it to be only a small upheaval of the great sag between the more pronounced elevations of the eastern and western summits; and the climb over the dome-like summit to the west, one hundred rods distant, revealed nothing but a still wider extent of thick forest. We found no water on or near the summit. Descending to the southern edge of the ridge, we searched for an outlook over the ledges, and for a long time searched in vain,—the ledges stopping below the summit, and the slope from the ridge down to them being covered with trees, and dangerously steep. At last, however, we found the coveted position almost at the extreme point of the western crescent; and the beauty of the view compensated for the long search. In front, and a little to the west, loomed high above us the huge double-peaked mass of Osceola, appearing much larger and grander than when viewed from the south. Directly in front of us, and the most impressive feature of the landscape, was the great chasm of the Mad River Notch,—its eastern wall being the long, steep, forest-covered slope of Kancamagus, its

western, the bold angular, abrupt precipices of Osceola; while far beyond, and filling the whole background of the striking picture, were the blue slopes and bluer dome of Sandwich.<sup>1</sup> The scene recalled a somewhat similar view of the Carter Notch from Pine Mountain in Randolph; but the more favorable location of the present outlook and the nearness of the Mad River Notch made the present scene even more impressive and satisfactory. Tripyramid was hidden from our vision; but to the east of the rounded summit of Kancamagus rose Passaconaway, visible in all its commanding beauty from broad base to tapering peak, — a perfect forest-mantled cone, the most symmetrical mountain in the landscape, a very sonnet in stone. Little Potash Mountain knelt in white at Passaconaway's feet; scarred Paugus stood humbly a little farther to the left; while eccentric Chocorua, nude, angular, defiant, stood far to the eastward.

From our outlook the crescent shape of the southern side of Huntington was very pronounced. We saw the whole semicircle of the swampy plateau below us, and more than half of the walls of the amphitheatre which enclosed it; while the eastern summit, peakless and domeless, stood a sharply defined half-mile of forest-covered level ridge. I was disappointed in not being able to take an aneroid measurement of the altitude, as I had expected to do. The State map is correct in making the eastern the principal summit; and it cannot be far out of the way in the estimate of its altitude, — 3,200 to 3,400 feet.

The descent was made easily by following the long ridge of the western summit, which slopes toward the forks of the Hancock Branch, — a ridge that would doubtless afford the easiest path of ascent to those who do not care to visit the cascades. About 6.30 P.M. we came out of the woods on the north fork of the Hancock Branch, about half a mile from the surveyors' camp, where we purposed to spend the night; and while the faithful guide went forward to cut wood for the midnight fire with his one arm, the other member of the party used both of his in enticing a few small trout to attend the evening meal.

<sup>1</sup> Black Mountain (Q. 8). — Ed.

## The Alpine Club of Williamstown, Mass.

BY SAMUEL H. SCUDDER.

Read Nov. 12, 1884.

MEMBERS of the Appalachian Club having repeatedly asked for information about the Alpine Club of Williamstown, and a recent reunion of some of the members of the latter under the shadow of Greylock having revived many pleasant memories, I have thought that some account of this older Club would be interesting to the members of the newer and larger body. The official Records and Chronicles of the Club have been kindly placed in my hands by the Perpetual Secretary; and for the account of their longest excursion (to the White Mountains), I have been able to draw upon several private diaries giving exact statements which memory might fail to supply.

The source and inspiration of the Club was Professor Albert Hopkins, at its foundation fifty-five years old, who beneath a somewhat stern and grim visage hardly concealed a tender spirit, a love of Nature, and a fondness for the companionship of the young. It was his crowning happiness to make other people enjoy themselves. Those students — and they must have been few indeed — who saw only the solemnity of his face in the class-room, or in failure of their duty met his piercing glance, little understood the man. To know him out of doors was a fascination and a perpetual inheritance. He was the patron saint of the Club.

The Club was formed in April, 1863,<sup>1</sup> the membership consisting at first of nine ladies of Williamstown, — Miss Dewey, Miss Tatlock, Miss Ruth Sabin, Miss Bessie Sabin, Miss Whitman, Miss Foote, Miss Louisa Hopkins, Miss Kilby, and Miss Carrie Hopkins, to give them in the order they appear on the official list, with Professor Hopkins, Professor Chadbourne, and Rev. Harry Hopkins. During the year Miss

<sup>1</sup> It is thus the oldest mountain organization in the country, the White Mountain Club having been formed in 1878, the Rocky Mountain Club about 1875, and the Appalachian Mountain Club in 1876.

Adriance, Mr. Scudder, Mr. Goodridge, Mr. Griffin, Mr. Edward Hopkins, and Mr. Sabin were added ; in the following year, Mrs. Dewey and Rev. Mr. Tatlock, and subsequently Miss Mather, Miss Gould, Mr. Gardner, and Mr. Denison ; — these twenty-four constituting the total membership of the Club, so long as the record of its doings was preserved.

The object of the association was declared to be “to explore the interesting places in the vicinity, to become acquainted, to some extent at least, with the natural history of the localities, and also to improve the pedestrian powers of the members.” The officers — elected once for all — were a Leader (Miss Dewey), a Chronicler (Professor Hopkins), a Secretary and Treasurer (Miss Carrie Hopkins), a Surgeon (Miss Bessie Sabin), and a Bugler (Miss Whitman). The Club was to meet weekly or fortnightly, at discretion, for an excursion ; and any member taking a private excursion “of any length” was “required to write a detailed account of it for the benefit of the other members.” It was provided that no new members were to be admitted “unless they are possessed of good pedestrian powers, are enthusiastic lovers of Nature, and show a willingness to receive instruction from the members of older standing !”

The duty of the Chronicler (that of the other officers is obvious) was declared to be “to write an account of each excursion, which is to be read to the Club on the next ensuing excursion or at a meeting of the Club.” This duty was not always performed by the Chronicler *ex officio*, but a special chronicler was often or perhaps usually appointed at the close of an excursion to write the account of it ; and these Chronicles, many of them still in the Secretary’s possession, have been liberally drawn upon for statements. This duty of Chronicler was not always assigned even to a member ; but guests, invited to attend the excursions and looked upon with envy by their less fortunate acquaintances, often paid the penalty for their delights by having this additional greatness thrust upon them. It should be added, as a significant fact, considering the preponderance of young ladies among the voters of the Club, that in every instance but one on record this office of Chronicler was conferred upon a gentleman. Perhaps this should

be expected in a collegiate town where women find no admission to the halls of learning.

The first walk taken by the members of the Club was on May 2, 1863, to Birch and Prospect Glens, a six-mile tramp over fields and rough wagon roads; and during the season, which lasted until November 4, when an expedition was made to one of the land-slides in the Hopper, nineteen excursions in all are recorded. One of them was a mountain climb to see the sun rise, starting at four o'clock; another a two days' camping expedition to Manchester for the ascent of Mt. Equinox, where it was formally "Voted, that we had a good time." Besides these excursions, various other meetings for business or for social enjoyment were held, summer and winter, in the village. One of these records a congratulatory visit to their patron saint on his birthday.

The two succeeding years during which the records of the Club's wanderings are officially preserved, a similar activity was maintained. Eighteen tramps were taken in 1864, the first on April 16 and the last on October 6, including two camping excursions, — one to Pontoosuc Lake, where the party, with invited guests, numbered twenty-six, and one of three days to the Hopper, in which seventeen persons joined; of this latter mention will again be made.

In 1865 nineteen excursions were made, the first as early as February 7, upon the slope of East Mountain, the next on March 20, and the last on November 29. During this year a twelve days' excursion to the White Mountains was undertaken, — a fuller account of which is given further on, — and a three days' camping party, at the end of September, at a lovely spot in the woods on one of the hillsides about Williamstown, named by the Club "Eolacca" from a chain of three little lakes discovered there by the members. To this point frequent excursions were made, and various devices resorted to to make it still more attractive. Unfortunately the spring found the ponds "too high for beauty, entirely covering a promontory which was a very pretty feature in the view," and rendering the neighboring region marshy and difficult of access; accordingly the Club dislodged rocks from the mountain side above, and rolled them down to be so



placed as to afford a better approach to the shore. At another time our energies were turned in the opposite direction, changing the course of a stream that it might feed the lakes; for on one occasion when a party of twenty or thirty were invited to join us at this favorite spot, we were chagrined and disappointed to find that, owing to the unexampled drought of the season, our favorite lakes had quite disappeared.

The records of the excursions of the Club are simply told in the Record Book of the Club. The following may be taken as a single sample:—

“On Wednesday afternoon, October 18, in spite of a cloudy and threatening sky, a walk which had been planned to Eolacca was undertaken. Professor Hopkins offering, however, to take the party to Huge World,—a spot unexplored by the Club,—it was resolved to go there instead. The gathering of chestnuts, bright leaves, and berries made the progress up the mountain a slow one, and a slight rain was falling when Laurel Glen was reached. Undeterred by this, however, the Club clambered up the ledge, and, seated on the edge of Pulpit Rock, enjoyed the view of the valley with the shower sweeping over the distant mountains. Just north of this they stood on Solomon’s House-top, and watched the crashing descent of numerous rocks which Professor Hopkins and Mr. Denison, by great exertions, loosened from their resting-places and rolled down the steep. After a visit to Geological Rock, and a climb to the top of both Senek and Bozez, they descended once more into the glen, and, the rain then coming down quite briskly, found a cave, where they built a fire and rested for a while till the shower passed on and they were able to return home.”

These walks were usually taken in the afternoon, often lasting until late in the evening, to gain the advantage of cooler air and to see the beauties of Williamstown by moonlight. But not unfrequently they took the greater part of the day; and after the return from the memorable tramp at the White Mountains, one was made which was ten hours long. We were often overtaken by showers, which we little heeded if we could find some pretty nook, an abundance of flowers or bright foliage, a charming view, or an unexpected cascade. The whole region about was scoured. To mention only the places specified in the Records and Chronicles, we find, besides those already given above, trips to Hoosac, South

Williamstown, Pownal, and the White Oaks ; ascents of Greylock, Arbutus, Audubon, Anthony, and Bald Mountains, Stone, Northwest, and Mason's Hills ; visits to Ford's and Flora's Glens, Pownal Pond, the Punch Bowl, the Basin, the Forks, Broad and Complexion Brooks, Wambeck Cascade, the March Cataract, the Cascades, and the Falling Waters, Bear and Deer Springs, Birch Avenue, Golden Vista, the Heart of Greylock, Pine Grove, the Rocking Stone, Organ, Copper Bolt, Knot, Cobble, and Amphitheatre. Not a few of these spots were discovered and named by the Club, and it was our delight to display their beauties to the guests we invited to join us.

One of the most memorable excursions was made in 1864, when a large party went to the Hopper, the deep ravine on the west face of Greylock, and camped for three days at Bacon's, the town poor-house, the ladies occupying at night the ground *floor* and the gentlemen bestowing themselves in the barn. Here we sketched, botanized, penetrated the depths, made various studies in natural history and sociology, and counted as our chief exploit a climb up the steepest face of Greylock. Nine of us made this last excursion, the gentlemen and half the ladies being the same as undertook the White Mountain expedition the following year. The ascent was by the way of the March Cataract, and it was estimated that in the spring at one point a view could be had of a continuous thread of water nearly five hundred feet in length. The story of the descent of the mountain may be borrowed from the Chronicler, who entitled his account "Baconian Reminiscences ; or, The Short and Simple Annals of the Poor-House."

"The proposal to return by way of Bald Mountain led to adventures unparalleled in the annals of the Club. Leaving the summit at about a quarter past two, after a rest of about an hour and a quarter, and a refection consisting largely of crumbs, the party, after going down the mountain for three quarters of an hour or so, found that they were on the east side, instead of the west, and it became necessary to regain the ridge. Still moving southward, only inclining to the west, rather than to the east, as heretofore, we again gained the ridge, and followed its gentle inclinations up and down ; tearing through the

underbrush, sinking in the decayed vegetation, tumbling over precipices, panting, tired, yet taking fearful note of the waning day, we travelled full three miles further on the ridge, southward, and finally descended almost at the southern extremity of Saddle Mountain. We danced hilariously, and flaunted our 'rags' in the wake of the setting sun, as we reached the cleared level which overlooks, in what appeared an alarming proximity, the lakes at Pittsfield and Pontoosuc. More than a mile remained, of field and forest, down the side of the mountain, before we reached, at twenty minutes past seven, the habitation of 'speaking men,' and bade old Greylock with his dusky woods 'Good-night.' Six miles were we from where we meant to be. Bald Mountain was far to the north of us, and eleven miles at least of climbing and clambering, and rolling and slipping, and stumbling and tearing, prepared us to appreciate the Deacon's prancing steeds that saved us six more weary miles. But our spirits were light in the prospect of chickens and barns, and we were not unthankful in the retrospect of serious dangers passed.

"Furious dogs; 'talkful' deacons, and sociable maidens in high converse; benefactions of warm coats and shawls; picturing of the Bacons and 'street folks' in solemn conclave, like a coroner's inquest; 'Do they think of me at home?' a ride through the darkness; a blast of a trumpet; a solemn tramp; music in the distance; the advance of torches through the murky night; a rush; a passage of arms; embraces; kisses, unequally bestowed; a Babel of tongues; a rush of the famishing to the groaning board; the clash of steel; questions, answers — and over the home of the Bacons silence reigned supreme."

The Chronicler ends his story with "the titles of a few unwritten chapters in this strange eventful history," from which we may extract the following: —

"Cap. 201. How the 'street folks' came up to Bacon's, and made an attack in force on the commissariat, and a'e up all the provision.

"Cap. 202. An investigation into the chemical properties of saleratus, to be communicated to the 'Laws of Life.'

"Cap. 204. Of the influence of perpetual motion in producing jollity, — a metaphysical inquiry.

"Cap. 205. Of the expression of Mrs. Bacon's countenance when she supposed we had walked home from New Ashford, and her accustomed politeness alone prevented her saying what she thought.

"Cap. 300. Report of a committee appointed to ascertain with whom the guide was talking when he led us in the direction of South Adams, and what was the subject of their discourse."

The trip to the White Mountains was first mooted, I believe, on this excursion, and was carried out the following year by a party of eight.<sup>1</sup> As the only one who had often visited the mountains, it fell to my lot to guide the party, particularly in the walk over the Great Range. Three of the party started from Williamstown, the rest from various other places. All meeting as by agreement at White River Junction, on August 22, and taking the train together to Littleton, we made our first entrance to the mountains proper at the Profile House, where we were properly introduced to the pleasures of White Mountain travel in those days, by securing a single room for the five ladies and the parlor floor for the three gentlemen. The next day was spent in the Notch, and in the afternoon of the day succeeding we hired a team for two days and drove to Brabrook's. On the 25th we drove to the Crawford House, and walked up Mt. Willard; then, stopping by the way at the Silver Cascade, we drove to the Waumbek House and dined, and at a little before five started again for Imp Cottage, or Dolly Copp's, at the foot of Mt. Madison, by the way of the old Pinkham Notch road, then in a very rough condition. Night came on while we were in the woods, and we were obliged to lead the horses by the light of a candle held in a hat, so that it was eleven o'clock before we reached our destination. Saturday was spent at Glen Ellis' Falls and Crystal Cascade; Sunday at Madison Brook and Diana's Baths, with service by the Chaplain, and on Monday we began our long desired climb of Mt. Washington. We made a tolerably early start, the ladies riding as far as the Glen House; from this point one of the party (the Chaplain, who had suffered from a slight sprain and wished to save himself for the next day's walk) went up in the stage, while the rest, starting at 8.30, walked up the carriage-road to the old Tuckerman's Ravine path and ascended by the ravine, dining at Hermit Lake, and reaching the summit, then in the clouds, at 4 P. M.

<sup>1</sup> Mrs. Mark Hopkins, Miss Carrie Hopkins (Mrs. Denison), Miss Fanny Dewey (Mrs. Bailey), Miss Fanny Whitman (Mrs. Von Jagemann), Miss Julia Gould, Rev. William Tatlock, Mr. (afterwards Professor) Edward Griffin, and the writer.

The next morning we had promised, if the day favored, to return to Dolly Copp's by a route that had never been travelled before in its entire extent by women. Since then many have gone between Adams and Washington, and some, no doubt, from Madison to Washington; others have travelled in a single day from the Appalachian camp on Adams to the summit of Washington; and not unlikely some have passed, as we proposed to do, from Washington to Madison (or Adams) and then down to the valley: but I do not know that even now any ladies have attempted to make the descent from Madison (or Adams) *without a path*, after the scramble from Washington. I have repeatedly asked the older guides, and they had never heard of such an undertaking at that time. It was undoubtedly hazardous; but I was then very familiar with that particular route, and had more than once traversed the ridge in the clouds, and descended through the forest by night.

We were up at half past four to see the sun rise; but the clouds soon afterward gave too much anxiety to permit us to venture on our walk until some time after breakfast. Finally, taking every precaution, with compass directions (repeated at every summit), we started at 8.20, in high spirits, amid the warning of the guides, leaving the Matron to descend in the stage and await us at our journey's end. We stopped a few moments before ascending Clay to peer into the depths of the Gulf of Mexico, and then started on our first ascent, reaching the summit of Clay at 9.25. Jefferson was reached at 11; but we could not stop for any view or compass observation, as we were, for the only time, enveloped in clouds. In forty minutes we were at Alpine Club Gap, as we designated the vicinity of Spaulding's Spring, and at once began the long ascent of Adams. This we reached at half past one, and, stopping a brief time to take in the noble view, never finer than on that day, descended again to the gap at the head of King's Ravine, which we reached at half past two. Here we stopped about half an hour for rest and a frugal lunch, and then made our last ascent, that of Madison, where we stood at half past three. We next followed down the easterly ridge of Madison until opposite the most favorable point of

descent into the forest, took the precise bearing of Imp Cottage, here in view, and at half past five left the open crest for the perils of the forest. Our way led through the "silver forest" and the succeeding tangle of scrub, where the strength of our clothing was put to the severest test. Twilight was approaching; and the moment these provoking obstructions were passed, we made greatest speed down the steep acclivity while any light was left. It was densest night by the time we were half-way down and had passed the steepest part of the descent. Our only guides were an occasional look at the compass by aid of a match, the general lay of the land, the vague uncertain ridge-line at our right occasionally seen against the sky, and the distant sound of Madison Brook when we swerved too far to the left. We kept as near as possible in Indian file, threading our way with such care as we could. "Word was passed from front to rear of every stone and gully and fallen tree that lay in our way. Stopping for nothing, going around nothing, but under or over every obstacle, the cry of 'Here's a log' and 'Here's a hole,' would pass along the line as, one after another, we stumbled on; or, 'Here's a rock,' 'a slight ascent,' 'a little descent,' 'look out for the underbrush.' But by and by we ceased to frame admonitory sentences, and 'log,' 'rock,' was passed backward mechanically. Now and then would be heard a spasmodic 'Oh!' from the much-enduring Secretary, when one foot went unexpectedly deep into the soft moss and leaves, or stumbled over a rock. Nobody said any more than could be helped except the irrepressible 'Tutor,' who made observations from time to time, designed to carry conviction to every heart that the situation was encouraging. Refreshed by a pull at the Chaplain's brandy-flask, the Bugler attempted to blow a blast, but failed to make it very effective. But now and then we tried again, and woke the echoes of the mountain-side, in the hope of reassuring an anxious friend below. We had been nearly four hours in the woods when we heard, or seemed to hear, the sound of a distant horn. Presently we heard it again, and more distinctly; but whether it came from in front or behind, from the right or the left, none but a woodman could tell." After a little further descent there was no

longer doubt; for the baying of dogs could be heard from two points directly in front, — plainly Copp's and Calhoun's, the two farm-houses in the valley, — and "more exhilarating than a fresh flask of brandy was the sound." We pushed on, and in a short time were met by parties from below, just as we were about to emerge from the woods, within ten rods of the point at which we had aimed, — the point of the triangle made by the highest clearing above Copp's House. We reached our quarters again by half past nine, having been a little over thirteen hours on the road. The next day the party, rising at an early hour, left for home by the Portland boat.

After this year no formal records of excursions were preserved. Members were added to the Club, but not in great numbers. The original twenty-four have nearly all left Williamstown, though it is still there that occasional reunions take place. The Club is by no means extinct; but it lives rather in the pleasant memories of the past than in the exploits of the present.



The badge of the Club is a small bit of green silk, with a shield embroidered in outline upon it in old gold, an Alpine horn in the centre, a falling spray of vine above, and the letters A. C. below.

---

### The Record of a Day's Walk.<sup>1</sup>

BY EUGENE B. COOK.

LAST summer, my friend Mr. G. A. Sargent was desirous of going over the peaks from Madison to Washington, and

<sup>1</sup> To give the publicity of APPALACHIA to this account of a remarkable feat of mountain pedestrianism may seem like a betrayal of its modest author. It is taken from a letter of Mr. Cook, written in response to a note of inquiry. In extenuation we plead the great interest the record will have for our readers, from the fact that so many of them can recall whole days of by no means easy labor spent in accomplishing one portion or another of the way traversed in this audacious *tour de force*. — ED.

wished me to accompany him. Having twice traversed the mountain-tops from Washington to Madison, down to Copp's on the Pinkham Road, I revolved in my mind the various additions that could be made to the usual programme. My first idea was to go over the peaks to Mt. Washington, and return by the Glen and the Pinkham Road to our starting-point, — the Ravine House. Then it occurred to me that the return might be extended so as to embrace Tuckerman's Ravine. Finally, the idea suggested itself that the peaks from Madison to Washington could be traversed, the Great Range followed by the Crawford Path (taking the tops of Franklin and Clinton on the way), and the return made from Crawford's by way of the Cherry Mountain Road and Jefferson, — all within a day.

The time of the full moon was chosen as best; and, the weather proving propitious, the two pedestrians started on their projected feat on the morning of September 27, 1882. In the early morning the whole interval glistened with frost, silvered by the beams of the nearly full moon, which was still aloft in the west. On the way up Mt. Madison, in crossing a bridge made of two young trees of considerable length, which spanned Snyder Brook, Mr. Sargent slipped upon the frost-covered string-pieces, and one of his ankles got caught between the two elastic young trees, so that he was held in dangerous durance. He endeavored to extricate himself; but, as with Milo the athlete, escape was possible only in the teeth of a *bear* possibility! His companion hastened back to the rescue, and, by the use of a walking-staff as a lever, soon released the prisoner, and was glad to find that no serious injury had been sustained. On emerging from the tree-growth the rocks were found to be covered with a thick coating of frost-work, and little pools of water on the rocks had become ice. The wind was cold, and was blowing briskly from the eastward, while mist-clouds were surging up the ravines and often temporarily capping the mountain-tops. In going from the summit of Adams to the col between it and Jefferson, the driving clouds caused the pilot to deviate a little from the nearest route, — making an addition of about a hundred and fifty yards to the distance. As the sun got



higher the scud decreased; and when we were on Jefferson the whole ridge became clear. At the water-tank on Mt. Washington, near the col between it and Mt. Clay, long stilettoes of ice were hanging aloft; and below, successive icy coatings had made a small sliding-rink.

An hour and a quarter was spent on Mt. Washington, during which time we luxuriated in refreshing rest, feasted with the greatest relish and desire, and ended by enjoying the fascination of the inexhaustible view. When we reached the part of the bridle-path which skirts Mt. Clinton, we made a detour to the summit of that mountain, and there devoted some time to a study of the surrounding objects of attraction. Shortly after we left Crawford's, the full moon rose with majestic splendor over the Great Range, which we had traversed, while the serene luminary had apparently more than half encircled the world. At the White Mountain House we were refreshed by an excellent supper and a short repose. On the way over the Jefferson Meadows a chilly fog kept us from lagging in our gait. A few rods from the Ravine House we saw the gleam of a friendly light, and, on knocking at the door, a faithful collie first responded, and then our worthy host appeared and welcomed us in, where we found an inviting table awaiting the prodigal walkers.

The appended table gives the times and distances made, together with the several rests.

# THE RECORD OF A DAY'S WALK.

57

	WALKING TIME.	STOPS.	TOTAL TIME.	DISTANCE.	MILES.
Left Ravine House at . . . . .	5.03 A. M.				
Reached Mt. Madison . . . . .	2 h. 27 m.	+ 12 m. (three stops on the way)	= 2 h. 39 m.	3 m. 1,390 yds. =	3.79
Reached Mt. Adams . . . . .	1 h. 4 m.	+ 3 m. (on Madison)	= 1 h. 7 m.		
Reached Mt. Jefferson . . . . .	1 h. 27 m.	+ 3 m. (on Adams)	= 1 h. 30 m.		
Reached Mt. Clay . . . . .	1 h. 13 m.	+ 3 m. (on Jefferson)	= 1 h. 16 m.	Detour of 150 yds. =	.08
Reached Mt. Washington . . . . .	57 m.	+ { 4 m. (on Clay) 4 m. (at tank on Washington) }	= 1 h. 5 m.	6 m. 1,232 yds. =	6.70
Restored, dined, and enjoyed the view. . . . .	7 h. 8 m.	+ 29 m.	= 7 h. 37 m.		
		+ 1 h. 16 m.	= 1 h. 16 m.		
Left Mt. Washington . . . . .	1 h. 33 m.		1 h. 33 m.		
Reached Mt. Franklin . . . . .	52 m.	+ 5 m. (abreast of Pleasant)	= 57 m.		
Reached top of Mt. Clinton . . . . .	1 h. 8 m.	+ 10 m. (on top of Clinton)	= 1 h. 18 m.	Detour to top of Clinton 900 yds. =	.11
Reached Crawford House . . . . .	3 h. 33 m.	+ 15 m.	= 3 h. 48 m.	8 m. 880 yds. =	8.50
Stop at Crawford House. . . . .		+ 8 m.	= 8 m.		
Left Crawford House . . . . .	1 h. 23 m.		1 h. 23 m.	5 m. =	5.00
Reached White Mountain House . . . . .					
Restored and supped . . . . .		+ 40 m.	40 m.		
Left White Mountain House . . . . .	2 h. 20 m.				
Reached Jefferson Station . . . . .	3 h. 10 m.				
Reached Ravine House . . . . .	5 h. 30 m.		5 h. 30 m.	18 m. 880 yds. =	18.50
	17 h. 33 m.	+ 3 h. 48 m.	= 20 h. 21 m.	43 m. 1,212 yds. =	42.68
Average distance made during actual walking-time, 2,466 miles an hour.					

## Bibliography.

**PENNSYLVANIAN MAPS.** Published by the Second Geological Survey, Professor J. P. LESLEY, Director. Harrisburg, 1878-1883.

It is natural to expect fine illustrations of the expressive topography of Pennsylvania among the publications of the Second Geological Survey; for Professor Lesley, Director of the Survey, has long been known as the leading expounder of topographic geology in the eastern United States. His little classic on "Coal and its Topography," now out of print, and his brief paper on the five types of earth surface between Cincinnati and the Atlantic seaboard,<sup>1</sup> as well as his sketch map of Pennsylvania, are worthy of attentive study by those who walk among the mountains with a desire to look into them as well as off from them, and seek to learn something of their internal structure from their external form.

The greater number of the geological county maps that have been issued by the Survey give no topography but streams, roads, and towns; and their neatness of execution is unfortunately not a measure of their accuracy. But, besides these, several careful surveys have been undertaken. Morrison's Cove, a peculiar anticlinal basin, enclosed by even-crested ridges of Medina sandstone, with an adjoining area, including altogether parts of Blair, Bedford, and Huntingdon Counties, was surveyed by Mr. R. H. Sanders, and published (in 1881) on fourteen large sheets, on a scale of an inch to 1,600 feet, or about three and a quarter inches to a mile (1:19,200), with contours every twenty feet, and geological coloring. From these sheets Mr. E. B. Harden has constructed an accurate model,<sup>2</sup> that well repays examination. Those who cannot see the model should at least examine the phototype of it, printed in the Proceedings of the American Philosophical Society in 1881, as it gives the best view of a piece of characteristic Pennsylvanian topography that has yet been published.

A broad strip of country, from Reading on the Schuylkill to Easton on the Delaware, across Berks, Lehigh, and Northampton Counties, has been mapped on the same scale, with ten-foot contours. Six sheets, dated 1878, are devoted to Northampton County; and seventeen more, dated 1883, include the Durham and Reading Hills (= South Mountains) and the adjoining valleys. These South Mountains of Berks County are not to be confounded with South Mountain, between Adams and Franklin Counties, southwest of Harrisburg and near the Maryland line, and of which similar topographic sheets have been published. Both of these regions are occupied by Archæan gneiss and Lower Silurian sandstones and limestones, — the latter in a very disorderly condition, and all without visible and simple type of structure, — so that the maps, although detailed and conscientious pieces of work, are not so interesting as one of the Seven Mountain region would be, where the peculiar Appalachian structure and form are well developed. By all means, have a survey of the whole State if possible; but if only a small fraction of its area can be surveyed, we should have preferred the selection of its more characteristic features for portrayal.

The only map illustrative of the palmate topography of the western half of the State is that of McKean County. This is not constructed on a good trigonometric basis, but is simply a county map, on a scale of two miles to an inch, with barometric contours every hundred feet. It is nevertheless very expressive of horizontal structure, when contrasted with the maps of Morrison's Cove above mentioned.

The latest issued and probably the best members of this series are the topographic maps included among the elaborate sheets prepared for the special survey of the anthracite region, under the direction of Mr. Charles A. Ashburner. First to be named is the

<sup>1</sup> Trans. Amer. Phil. Soc., 1869, Vol. XIII. p. 305.

<sup>2</sup> Copies of this model may be obtained from Mr. Harden, 907 Walnut Street, Philadelphia.

map of the Panther Creek coal-basin, — the synclinal at the eastern end of the southern anthracite coal-field, — reproduced on the same scale as those already described from surveys by R. P. Rothwell, M.E., in 1869, for the Lehigh Coal and Navigation Company. Its eastern end includes Mauch Chunk on the Lehigh River, and thence westward follows the direction of the well-known "Switch-back Railroad." Corresponding to this, there have been lately published three topographic sheets for the eastern half of the coal area known as the "western middle field," including Ashland and Mahanoy City. Being prepared for the practical uses of coal-land owners, these latest sheets lose something of their topographic expression in the number and distinctness of the names printed over them. The mine sheets of the same series are marvels of comprehensiveness, but their value is technical and geological: their contour lines refer, not to the ground surface, but to the form of the underground coal-beds.

Besides these larger works there are many smaller maps, with surveyed or sketched contours that illustrate peculiar types of form: such are the maps of the Delaware and Lehigh Gaps (issued in 1881 in the volume known as G<sup>6</sup>, descriptive of the geology of Pike and Monroe Counties); and we may close this notice by referring our readers to the admirable little sketch-map reproduced from Professor Lesley's manuscript to illustrate his Notes on the Geology of the Schuylkill River, prepared last summer for the use of the members of the American Association at the Philadelphia meeting, and liberally distributed to those who went on the memorable excursion to the anthracite coal region. We hope it may be reproduced in the annual volume of the Association's Proceedings.

Perhaps when the Pennsylvanians awake fully to the value of these maps, as they are beginning to do, a State map on a smaller scale (say 1: 80,000) may be undertaken. There is already much material accumulated for it in the form of a well co-ordinated system of railroad levels, which would serve well as a basis for a series of fifty-foot contours; and they would not then be, in this respect, so far behind New Jersey as they now are.

W. M. D.

**BALTIMORE AND ITS NEIGHBORHOOD.** An Excursion Map compiled for the Johns Hopkins University. Edited by ALBERT L. WEBSTER. First Edition, 1884.

ALTHOUGH published under the auspices of the University at Baltimore, the appearance of this convenient and promising map is due to the initiative of the Naturalists' Field Club connected with that institution, — a society which, while covering a much narrower range, has many interests in common with our Club.

The map, which is intended as a *vade mecum*, is mounted upon cloth, the plate being cut and slightly separated at the folds, and when folded and in its case forms a thin parcel about six inches square. It embraces an area of twenty-five miles square, with the City Hall of Baltimore as a central point. The whole is divided into small squares, each a mile in area; the several ranges being lettered at the top and bottom, and numbered at the sides for ready reference. The map represents no new survey, but is a compilation of existing yet heterogeneous cartographic materials, and gives evidence of no small amount of labor. This work has been done under skilful direction, Mr. Webster having had four years' experience as topographer on the U. S. Geological Survey. "All maps, of whatsoever kind, relating to the area in question, were collected and carefully compared, the most accurate of them being reduced to a uniform scale. A drawing on the scale of two inches to the mile was then commenced, upon which, however, only the most reliable material — the work of the U. S. Coast Survey, which covered about one third of the entire area — was incorporated. The remainder of this drawing was left blank, with the intention of placing upon it in future only such material as is up to the standard of the Coast Survey work. For the remaining two-thirds of the area, a tracing was made from the best existing sources, and the two together (drawing and tracing) reduced one half and photo-lithographed." We note, as a somewhat serious defect, that in the process of reduction the twenty-five

miles are shrunk to twenty-three, making the scale appreciably less than one mile to an inch.

The chief interest of the work for us lies in the fact that it is to furnish a basis for the future complete map for the benefit of naturalists and excursionists. The plan is that of our department of Topography, with respect to the mountain districts of New England and regions adjacent, with the great additional advantage over that plan of publishing at once something definite and accurate, if not complete in detail, for distribution to the interested, or those who may become so, — a sort of memorandum blank for the reception of new facts gathered here and there, many of which would inevitably be lost but for a convenient depository of this sort. It will serve as a stimulus to many who desire to see their suggestions utilized; for "it is proposed to publish new editions from time to time, upon which it is very desirable to embody all available new information or corrections concerning roads, paths, accurately determined elevations, important local names," etc. The frequent criticisms upon the best existing maps of the White Mountain region that so frequently find expression in our Club meetings are a hint of what might be done with a good map adapted to receive the record of such corrections.

In the present edition of this excursion map, no topographical or hypsometric work is represented, although the soundings of the navigable waters, available from the Coast Survey charts, are given. Much attention seems to have been bestowed on the highways and byways, so useful to the Rambler in the vicinity of large cities. It is so disagreeable for the afternoon explorer to saunter into some one's clothesyard, or to be confronted by the domestic Cerberus while seeking the shortest way to or away from some attractive bit of suburban Nature! This map exhibits a perfect spider-web, with its straight turnpikes radiating from the town, these joined by irregular rings of cross-roads, with dotted lanes *ad libitum*.

Finally, the existence of such a map, from such a source, and with such a purpose, is a challenge to our older Club with its seat in a happily located metropolis. Why are we not at work upon a similar map of the neighborhood of Boston? We are capitally organized for such work; as good, probably a better, basis exists on which to build; doubtless far more unedited material is already at hand than the Field Club has collated, and a new and sufficiently accurate supply is about to be opened, under the combined operations of the State and the U. S. Geological Survey. Again, the remarkably accidented topography of eastern Massachusetts offers a field at once more attractive in its detail and affording promise of more interesting cartographic results than perhaps the vicinity of any large seaboard city of the Atlantic Coast. Will not our department of Topography, while not diminishing its zeal for the more ambitious plan which it has conceived, charitably foster a popular plan for a work of this humbler character, which shall begin at home?

C. E. F.

#### ANNUAIRE DU CLUB ALPIN FRANÇAIS. Vol. X., 1883. Paris, 1884.

THIS handsome book, well and profusely illustrated, reports the proceedings during the last year of a large and prosperous organization, only ten years old, but already numbering more than five thousand members. The extent of ground covered, and the variety of excursions and explorations chronicled, may be seen in the following list of papers: "The Passes and Defiles of the Vosges;" "Ormont: its Topography, History, and Legends;" "The Cañon of the Tarn," — three separate excursions in the French and Spanish Pyrenees, one being a record of seven nights (four consecutive) passed on the "Vignemale," by the Count H. Russell, very charmingly told; "A Round Trip in Dauphiny;" "Notes on the Arrondissement of Embrun, Hautes Alpes;" "Excursions in the Lower Alps and Ascent of Mt. Pourri;" "Ascents of the Ober-Gabelhorn and Töschhorn;" "Ascent of Mont Blanc by the Aiguille du Goûter;" "An Excursion in the Canary Islands, with Ascent of Teneriffe;" "An Ascent of Popocatepetl." Among

the scientific articles we notice "An Astronomical Voyage in the Pacific," by M. J. Janssen of the Institute; "A Theory of Volcanoes and the Central Plateau, — Present Theories, New Views," — by M. A. Julien, Professor at Clermont; "The Saint-Gothard Railway," by M. Charles Grad. There is also a digest of Dutton's "Tertiary History of the Grand Cañon District," under the title of "The Plateaux of Colorado: Landscape and Geological Structure according to the Reports of American Geologists," by M. de Margerie; as well as a report of new methods of barometrical measurement quoted from the "American Journal of Science," by the same author.

Among the short miscellaneous articles there is one especially deserving of notice, by M. A. Perrin, on "Pierres à bassins of the Valley of Chamouny." Guided by the young daughter of an Alpine shepherd, M. Perrin and his companion, the curé of Servoz, left the road from Chamouny to Sallanches just before reaching the Pont de Gurres. Above them the polished walls of rock showed well-defined glacier scratches, their upward direction denoting the upheaval of the ice as the valley grew narrower. At Pravesin, all around the shepherd's house lie great erratic blocks from two to three hundred feet square. They are known in the locality as "les pierres de fée," or "fairy-stones." Ascending the valley to La Roche, where the father of their guide kept his sheep, they were shown the objects of their search, the pierres à bassins, three in number, quite close to one another, all of the same kind of rock (fine-grained schistous graywacke, like that on the Col de Forclaz and at Houches). Four bowls or cups have been hollowed in these three stones. The first, in a rock that apparently maintains its original position, is oval in form, measuring 27 by 20 centimetres, 20 centimetres deep, perfectly regular in form, and carefully polished. The three others are excavated in erratic blocks of rounded form. The second of these, hollowed in the middle of the surface of one of these rocks, measures 45 centimetres in diameter, and 30 in depth, perfectly round, very regular, and well polished with some traces of erosion on the edges. The third is on the edge of the same block, which has been broken. The cavity is much larger, what remains of it being 30 centimetres, both in depth and diameter. The fourth is much smaller than the others, of very regular shape, measuring 11 by 12 centimetres, and 5 centimetres deep, — what has been called a "fossette," or a dimple, by other writers. They found no other traces of the hand of man in the neighborhood; but the curé assured his companion that he had discovered a bowl on a rock above Servoz. The use of these artificial bowls, or cup-shaped cavities, — found in many parts of Switzerland and northern Europe, as well as in India, — has been discussed by Desor and Faurel. The former finds in them a confirmation of a common origin, and Indian migration. But we must refer the reader to M. Desor's interesting pamphlet on "Les Pierres à écuelles," and M. Perrin's article in this volume of the "Annuaire."

The article on the Cañon of the Tarn gives us an enchanting glimpse of the Hautes Cévennes, that beautiful part of Central France skirted by tourists who persistently keep to the well-worn routes. Of the same geological structure as the Dolomite region of the eastern Alps, that marvellous color and picturesque formation are here reproduced on a smaller scale, though the "Desert," as its inhabitants still call it, has a severe beauty peculiarly its own. As the scene of the war of the Camisards, the last stronghold of persecuted Protestantism in France, the country is most interesting historically, and "La Brèche de Roland le Camisard" vies in natural beauty and heroic association with the far-famed Pyrenean pass of Roncevaux.

M. E. M.

ANUARI DE LA ASSOCIACIÓ D' EXCURSIONS CATALANA. Any Segon, 1882. Barcelona, 1883.

THIS second annual maintains the high standard set in the former issue, reviewed in Vol. III. p. 158. The division of the subject-matter is the same, and there is the same abundance of illustrations. The section of *Excursions* occupies nearly five sixths of the 600 pages. Two of the articles, relating to the high Pyrenees, by the Baron de Saint-

Sand, are in French. Señor Arabá y Solanas — our Corresponding Member — contributes a lengthy article (175 pages), entitled "De Ripoll à Girona," describing a circular tour in Catalonia, with eyes open not only to its scenery on mountain and plain, but also to its ancient architectural monuments, its history, legends, natural history, and even commercial economy, all amply illustrated by his ready pencil. Poetry is represented by some thirteen selections. Unlike those in the former annual, instead of being the productions of modern cultivators of a literary form, these are the traditional songs of the humbler classes; several of them are hitherto unedited, and are here preserved to Catalan literature, in some cases with the notes of the music. In this, as well as in the place that local archaeology holds in the Scientific section, the patriotic spirit of the society appears. One article discusses the recently found map of the West Indies of the year 1516, attributed to Palestrina, a Majorcan, — which is simply an insular Catalan. A copy of this interesting old chart is given with the text, together with a modern map for comparison.

C. E. F.

ILLUSTRIRTER FÜHRER DURCH DIE ORTLER-ALPEN. VON JULIUS MEURER, Präsident des Oesterreichischen Alpen-Club. A. Hartleben, Wien, 1884.

THOSE who visit the magnificent scenery of the Austrian Alps will hardly resist the temptation to purchase this dainty guide-book, even if they do not read German. It is the most attractive work of the sort that we have yet seen, — of the Baedeker form, printed handsomely on choice paper, and adorned with some forty illustrations, certain of them gems of heliotypy.

A new departure, that will be appreciated by the traveller, is a division of the book into two sections: the first, wherein it is intended to present the field synoptically, contains the facts which are essential to one arranging his itinerary; the second, descriptive and detailed, embodies such information as it is pleasant for the visitor to know. The high ideal of Herr Meurer, together with his experience, is a sufficient guaranty of the quality of the material. Space forbids the mention of several practical points; but we suggest it as a standard to any one proposing to publish a guide-book for enlightened tourists.

C. E. F.

BULLETIN OF THE U. S. GEOLOGICAL SURVEY, No. 5. A Dictionary of Altitudes in the United States, compiled by HENRY GANNETT, Chief Geographer. Washington, 1884.

THIS interesting compilation, which must contain in the neighborhood of 15,000 entries, was begun under the auspices of the Geological Survey of the Territories, and contains what has appeared in three previous lists published by the Survey, relating chiefly to the country west of the Mississippi, plus new matter, so that the present work embraces the whole country. The entries are made alphabetically by States. For the region east of the great river the railroad surveys have furnished a large fraction of the material. For certain States our Club is a frequently cited authority, notably in New Hampshire, where it furnishes more than 26 per cent of the 291 entries. The showing of Massachusetts may well excite surprise. Of 295 entries, 266 are furnished by the railroads; of the meagre remainder only nine are the heights of hills or mountains, of which the Club is the authority for about half. None of the hills about Boston — not even Blue Hill — are given! If such be the sum of reliable data with regard to our local hypsometry, more than ever urgent is the call for our Club to occupy itself with the topography of this vicinity.

C. E. F.

## NOTES.

IN the *Rivista Alpina Italiana*, Signor G. B. Miliani makes mention of the newly rediscovered stalactitic cave on the slope of Monte Vernino, near Fabriano, some fifty kilometres southwest from Ancona. The cave was visited in 1800, as inscriptions in its walls indicate; but latterly has been known only to the country people near its mouth, whose superstition forbade exploration by themselves, and whose conservatism prevented a wide-spread knowledge of its existence. It was recently discovered by a railroad employee, while on a search for fossils. Signor Miliani visited it early this year, and describes it at length. The principal cave is some two hundred and sixty metres long, while above it lies a parallel passage somewhat shorter, with quite frequent connecting apertures. Although not to be ranked as among the great caves of the world, it is remarkable for the variety in form and color of its stalactites. Some of these are quite large and notable, while others are unusually delicate.

IN the same publication, Signor A. Bruni, of the Milan section of the Italian Alpine Club, recounts his adventures during several winter ascents of mountains in the northern Apennines, near Pisa. The ascents were made mostly during December, 1883, and included l'Alto di Sella (1,723 m.), Tambura (1,890 m.), and Pisanino (1,946 m.); the last-named of which had been already unsuccessfully attempted by others. A few days later (in January, 1884), the same gentleman succeeded in gaining the summit of the Penna di Sumbra (1,765 m.). These mountains, not widely different in height from our own White Mountains, offered considerable difficulty to the traveller and his guide, who encountered icy slopes, where the rope was necessary; but the temperature was for the most part little below the freezing-point, a point certainly favorable to the winter ascent of the Apennines.

A LATE number of *L'Echo des Alpes* contains a reference to the recently published work by Dr. Theodore Petersen, on the "Club-Huts and Refuges in the European Mountains." These houses—or, more properly speaking, huts—have been constructed by the various Alpine Clubs of Europe, and are distributed as follows:—

Alps — German and Austrian . . . . .	112
Swiss . . . . .	30
Italian (including Apennines) . . . . .	32
French . . . . .	30
Pyrenees . . . . .	24
Carpathians . . . . .	39
	<hr/>
	267

Of these, 13 were uncompleted at the time of writing. Of the 112 German structures, 66 belong to the Deutscher und Oesterreichischer Alpenverein. The most elevated of these refuges is that of the Italian Alpine Club on the Matterhorn, at a height of 4,134 metres, and the lowest is in Transylvania, at 800 metres above sea-level.

J. R., JR.



## Reports of the Councillors for the Autumn of 1884.

### Natural History.

By CHARLES E. HAMLIN.

UP to the date of this report, accounts of observations in Natural History, made during the present year, have been received from two members of the Club.

The first communication, a series of botanical notes, furnished by Mr. C. E. Ridler, of Kingston, is herewith presented for publication in APPALACHIA.

Mr. George H. Witherle, of Castine, Me., last month (October) met with fine specimens of the boreal *Pinus Banksiana* (misprinted in my report for 1883), the Labrador or Gray Pine, growing upon the shores of Quakish Lake, the lowermost of the larger expansions of Penobscot River. This is the most southern point at which that interesting species has yet been observed, being some fifty miles south of what — till Mr. Witherle's discovery of it last year on the borders of Lake Ambejijis — was supposed to be its extreme southern limit. In Maine, as in British America and upon the south shore of Lake Superior, it occurs sparsely distributed among trees of various kinds, and never grouped in forest masses like other pines. In more northern localities it is dwarfed, unsightly, and worthless; while in the Penobscot region it becomes occasionally a stately tree, attaining the height of forty feet, with a trunk measuring at the base eighteen inches in diameter.

---

#### THE FLORA OF WILLOUGHBY NOTCH (JULY 14, 1884). BY CHARLES E. RIDLER.

THE best way of reaching the Willoughby Notch is probably by stage from Barton to the foot of Lake Willoughby, thence by steam-launch to its southern extremity, where the public house is situated. The stage-road from Barton is bordered on either side by fertile fields or by rich woods, amid which *Acer saccharinum* and *Acer saccharinum* var. *nigrum* are especially prominent.

The principal trees around and on the Willoughby mountains are the paper, the white, the yellow, and the sweet birch; of the maples, besides

the sugar, the striped (*Pennsylvanicum*) and the mountain (*spicatum*); various conifers, — spruce, hemlock, fir, arbor-vitæ (which here attains the height of a good-sized tree rather than a razed shrub), the graceful larch (*Larix Americana*), and the yew (*Taxus baccata, Canadensis*), growing on stumps, logs, etc., often to the height of ten or twelve feet. On bold cliffs, for which this region is famous, are seen a number of aspens (*Populus tremuloides*). The beech tree is abundant, and so is the mountain-ash. The butternut (*Juglans cinerea*) is perhaps not quite so common. Of the oaks, in my rambles of nearly a week, I remember seeing but a single one, — a small specimen, like the imaginary youth to whom Gratiano gave his ring, —

“A kind of boy; a little scrubbed boy  
No higher than thyself.”

This was seen in the “Flower Garden” at the base of the cliffs on Mt. Annanance. The *Alnus incana* and *Alnus viridis* are also found, — the latter near the summit of the mountain. The absence of pines is noticeable. Indeed, the inhabitants say that pines, except perhaps occasionally, do not grow there. In his little book, “A Yankee in Canada,” written some thirty years since, Thoreau says that pines in high latitudes are scarce. Between Quebec and St. Anne — thirty miles — he saw not one; but at St. Anne, near the Falls, he found a few.

These forests must be of great commercial advantage. The value of the sugar produced must be considerable. Then there is a large income from the cutting and selling of the logs. Last winter, at Willoughby, one man, from his woodland of five hundred acres, cut seven hundred thousand feet of lumber. From the shores of Lake Memphremagog twenty million feet of lumber are cut in a single year. And yet so dense are the forests that one does not miss the trees which are annually taken away.<sup>1</sup>

In the ride of six miles from Bartou to the steamboat landing at the foot of the lake, one passes, in the swamps, the bright yellow flowers of the *Senecio aureus* var. *lanceolatus*, an *Eriophorum*, and that great popular favorite often seen in the gardens, *Myosotis palustris*, — the true forget-me-not. At the base of the mountain, growing on rocks, perhaps near some pool, you will find *Lobelia Kalmii*, and, not far away, *Chiogenes hispida*.

Boldly out from the shore goes the little steam-launch; you pass into the middle of the lake, and soon are approaching the most interesting part of the Notch. Mt. Horr towers above you on the right, with its gloomy summit, — gloomy with its evergreen foliage of dark conifers. Pretty nearly up to the roots of the mountain you glide under Horr; then the course is suddenly turned towards the opposite shore. Before you rise the almost perpendicular heights of Mt. Annanance (or Willoughby), nearly 2,000 feet. The aspect of this latter mountain is different from that

<sup>1</sup> “The total steam and water horse-power used in Vermont in lumber-sawing is about one and a half times as much as it is in Massachusetts, or as 26 to 19; and about one third that of Pennsylvania, or as 26 to 80.” — *Compendium U. S. Census*, 1880.

of Horr. From the lake, the former appears wooded only part-way up, though the well-worn path to the top is almost wholly through the woods. For a long distance the upper part of Annanance has been weathered back from the lake. Except in the absence of the columnar structure, it resembles the Palisades of the Hudson.

In going up to the hotel from the landing, you will be sure to gather a few flowers of the *Oxalis Acetosella* and *Campanula rotundifolia*, for you do not even suspect that this delicate harebell is found everywhere around Willoughby. The ascent of Annanance begins a short distance east of the hotel. We make the ascent with Mr. Bradford Torrey, botanist and ornithologist. Scarcely do you enter the path when you behold great quantities of *Osmorrhiza brevistylis* in fruit, the berries of *Caulophyllum thalictroides*, the white flowers (with the sting) of the *Laportea Canadensis*, and the pink petals, with their delicious fragrance, of the *Viola Canadensis*. Wood and Gray both speak of the fragrance of *Viola blanda*, but say nothing of the fragrance of this other handsomer violet, or of that of *Linnaea borealis*, or *Sabbatia chloroides*, — “one of our handsomest plants.” Indeed, John Burroughs might add the names of a great many fragrant native flowers to the list which he has published. Of the other violets on the mountain were found *Viola pubescens*, tall in its grandeur, and *Viola rotundifolia*, with its large leaves flat on the ground. Both of these are abundant.

Of the ferns found on Annanance may be mentioned *Phegopteris polypodioides*, *Botrychium Virginicum*, *Dicksonia punctilobula*, *Cystopteris bulbifera*, *Aspidium cristatum*, *spinulosum*, and *acrostichoides*, and of *Adiantum pedatum*, for household decorations, enough to turn the head of any ordinary housekeeper. At the end of the first short but steep ascent after passing the sugar-house, one goes through a cleared space filled with *Epilobium angustifolium* and the vivacious notes of *Dendroica virens* and *Seiurus aurocapillus*.

In these wild recesses the feathered songsters are numerous this morning, and my companion's quick ear and eye enable us to enjoy many an excellent song, and to catch the sight of many a bird to me previously unknown. In this single climb, Mr. Torrey observed some twenty different species of birds.

Near a great projecting cliff, a little farther on, one of the numerous “Pulpit Rocks” in existence, down the sides of which the eye can penetrate into the dark mysteries of what is far below, grows the rare *Clematis verticillaris*. You have already passed specimens of orchids, of the rare *Odontorrhiza innata*, for example; of *Pyrola secunda*, *Trillium erectum*, *Actaea spicata rubra* and *alba*, *Viburnum lantanoides*, and other northern plants. On a rock overlooking the lake, on one of the summits of Annanance, is found the twisted pod of *Draba incana*. Near the summit occur *Sanguinaria Canadensis*, *Solidago virga aurea*, *Veratrum viride*, and *Cornus Canadensis*. Of this last I gathered two abnormal specimens, one with a white involucre of eight, and the other of ten petals, instead of the usual number of four.

On the afternoon of the same day on which Mr. Torrey and myself went to the summit of Annanance, we set out for the "Flower Garden." The somewhat vague directions obtained at the hotel were all we had to guide us. Where the "Flower Garden" is, or its distance from the Willoughby Lake House, we did not then know. According to our careful judgment, the slope of the ascent from the carriage-road has an angle of 45°, though towards the last of the way up it is undoubtedly much steeper. We started from the "Pulpit Rock," above described, bearing off gradually towards the left. This we came to do because, as we ascended, traces of an apparently recent land-slide were seen, up a portion of which we gradually and with great difficulty made our way. Generally the woods, which here do not grow so close together as to prohibit a passage, afforded the better means of ascent. Even here, however, our progress was much impeded in some places by the steepness of the ascent, and by the falling of numerous trees and the decaying of stumps across our way. The farther we went up the mountain the more intricate became the underbrush. For a long time we saw nothing to reward our efforts, and doubted whether we should see the "Flower Garden" at all. We still pushed on, however, up and up and up. The rocks finally appeared weather-worn, and piles of coarse sand were seen — washed from the friable masses above us. The "Flower Garden" was not reached until we had arrived at the very base of the perpendicular cliffs. The first flowers we saw were great masses of *Arabis petraea*; soon afterwards all the glories of this Alpine parterre burst upon us, and we felt repaid for our toilsome jaunt. From where we stood, the upright sides of the mountain towered three or four hundred feet. The width of the land-slide might be five hundred feet. Wherever the soil had found a lodgement, whether in the water-courses, in the crevices, or on some shelving rock, flowers grew in the greatest profusion, — *Hedysarum boreale*, *Saxifraga aizoides* and *oppositifolia* (?), *Potentilla fruticosa*, and *Aster graminifolius* being conspicuous. *Carex scirpoidea* was more rare, and so was *Smilacina (stellata)*?. Another rarity was *Primula Mistassinica*. The number and variety of the flowers in this garden are far more extensive and enticing than those over "the thousand ice-cold rills" of the famous Tuckerman's Ravine.

Along on one side of the ravine, the left in our ascent, was a single *Asclepias*, a single *Vitis (cordifolia)*?, plenty of *Thalictrum Cornuti* in full bloom, and a root of the *Rhus Toxicodendron*. *Apocynum cannabinum* var. *glaberrimum* was sparingly found, whereas in our morning walk *Apocynum androsaemifolium* was common.

In the mean time, from a more elevated position, my companion enthusiastically shouts, "Come and see this fern which I have found." With considerable difficulty I obey; and there, under the roots of a fast-decaying stump, in a space which you could cover with one hand, is the delicate *Woodsia glabella*.<sup>1</sup> While we are gathering a few fronds only, in order

<sup>1</sup> This fern, I have since been informed, is common on Mt. Annanance. We found, however, this solitary spot where it grew.

to preserve the rest from destruction, my attention is directed to another fern still smaller and still rarer ; for, with all our diligent search, we can each of us find but a very few specimens, and but a single fertile frond, of *Pellaea gracilis*.

During my stay of nearly a week at Lake Willoughby, I gave considerable study to the form of the radical leaves of *Campanula rotundifolia*. Probably between one hundred and two hundred plants were observed. Of many flowers, particularly those that had been open for some time, these leaves, as might be expected, had disappeared. Some of the radical leaves appeared to be lyrate, some spatulate, some almost linear, many with eight or ten concave sides, and a very few with leaves which might in any way be called ovate or rotundifolia. They seemed to present about all the possible forms between round and linear ; so that the statement in Gray's Manual concerning these leaves, "mostly toothed or crenate," did not in this locality, so far as my observation extended, seem to be true.

---

LIST OF PLANTS FOUND ON OWL'S HEAD, NEAR LAKE MEMPHREMA-GOG, CANADA, JULY 11, 1884. BY CHARLES E. RIDLER.

1. *Allium tricoccum*, Ait. (Sparingly, about one third the distance from the base.)
2. *Corallorhiza multiflora*, Nutt. (Sparingly.)
3. *Woodsia Ilvensis*, R. Br.
4. *Lycopodium lucidulum*, Mx.
5. *Lycopodium clavatum*, L.
6. *Lycopodium dendroideum*, Mx.
7. *Botrychium Virginicum*, Swz. (Abundant.)
8. *Botrychium lanceolatum*, Ang. (Mr. Torrey, a few days later.)
9. *Solidago virga-aurea*, L. (Summit.)
10. *Solidago virga-aurea* var. *humilis*, Gray. (Summit.)
11. *Hepatica acutiloba*, DC. (On the right-hand side of the path, not far from the top.)
12. *Pellaea atropurpurea*, Link. (Mr. Nichols.)
13. *Polypodium vulgare*, L. (On a great boulder near the summit.)
14. *Aspidium acrostichoides*, Swz.
15. *Struthiopteris Germanica*, Willd. (In great abundance in one locality, not far from the base.)
16. *Adiantum pedatum*, L. (Very common.)
17. *Pteris aquilina*, L.
18. *Aspidium dilatatum*, Willd.
19. *Aspidium Goldianum*, Hook. (With *Struthiopteris Germanica*, very abundant in that locality.)
20. *Onoclea sensibilis*, L.
21. *Asplenium thelypteroides*, Mx. (N.)
22. *Asplenium Filix-foemina*, Bernh. (N.)
23. *Aspidium intermedium*, Muhl. (N.)

24. *Aspidium marginale*, Swz. (T.)
25. *Botrychium matricariaefolium*. (T.)
26. *Aspidium aculeatum*, Swz. (N.)<sup>1</sup>
27. *Aspidium aculeatum* var. *Braunii*, Koch. (T.)
28. *Cystopteris bulbifera*, Bernh. (Abundant.)
29. *Osmunda Claytoniana*, L.
30. *Viola Canadensis*, L. (Pretty common.)
31. *Osmorrhiza brevistylis*, DC. (Common.)
32. *Linnæa borealis*, Gronov. (Near Eagle's Nest.)
33. *Pyrola elliptica*, Nutt. (Near the hotel.)
34. *Aquilegia Canadensis*, L. (Several plants were found in bloom.)
35. *Trientalis Americana*, Pursh.
36. *Aralia nudicaulis*, L. (Near the summit.)
37. *Potentilla Norvegica*, L.
38. *Potentilla tridentata*, Ait. (Summit.)
39. *Coptis trifolia*, Salisb. (Near the summit, common.)
40. *Rubus odoratus*, L. (Common.)
41. *Acer spicatum*, Lam. (Rich woods.)
42. *Acer saccharinum*, Wang. (Abundant.)
43. *Habenaria dilatata*, Gray.
44. *Habenaria viridis*, R. Br., var. *bracteata*, Reich.
45. *Chimaphila umbellata*, Nutt. (Near Eagle's Nest.)
46. *Diervilla trifida*, Moench.
47. *Tiarella cordifolia*, L. (Very common.)
48. *Aralia hispida*, Mx.
49. *Clintonia borealis*, Raf. (Common, at a high elevation.)
50. *Oxalis Acetosella*, L. (Common.)
51. *Cornus Canadensis*, L.

Thus it will be seen that Owl's Head presents many attractions for the botanist, especially if he is a seeker of ferns, of which twenty-five species or so were found by the Rev. H. P. Nichols, Mr. Bradford Torrey, and myself.

## Reports of the Councillors for the Autumn of 1884.

### Art.

BY JOHN WORCESTER.

IN accepting the nomination of the Committee as Councillor for this department, I expressed the fear that I should be unable to do anything for the department on account of other pressing engagements, and I regret to say that this fear has been entirely realized.

<sup>1</sup> And perhaps half a dozen others not mentioned.

There were placed in my charge early in the year a series of ten photographs of picturesque scenery in Colorado, five of them forming a panorama, and all handsomely mounted in one frame. They were taken by Mr. Gardiner H. Scudder, and presented to the Club by his father, Mr. Samuel H. Scudder. I received also from the Recording Secretary five lantern slides of interesting views in Norway; and five of Mt. Popocatepetl in Mexico, — which last were prepared, at the expense of the Club, to illustrate the lecture by Mr. Fred A. Ober.

The department has also received, through the Corresponding Secretary, a most interesting set of twelve large and forty cabinet pictures of the Tyrolese Alps and adjacent scenery, from the Società degli Alpinisti Tridentini; and five beautiful views from the summit of Humphrey's Ledge, in Bartlett, N. H., from Miss Ellen J. Baker. The Corresponding Secretary has also transferred to the department a set of ten views taken in and about Ossipee Park, Moultonborough, N. H., and given to him by Mr. B. F. Shaw, of Lowell, the proprietor of the Park.

I have been informed of several other sets of photographs that are in the course of preparation for the benefit of the Club. There will be no difficulty in procuring a considerable collection of good mountain views, when the Club can provide a convenient place to receive and display them.

---

## Reports of the Councillors for the Autumn of 1884.

### Exploration.

By EUGENE B. COOK.

THE Councillor of Exploration has the honor of offering a brief report upon what has been accomplished in his department during the past season. Much of the work has already been informally reported in papers read at meetings of the Club. At the autumn Field Meeting, at Gorham, Mrs. L. D. Pychowska read a paper setting forth the attrac-

tions of "Mt. Crescent," Mr. W. H. Peek submitted a detailed account of "The Ice Gulch in Mt. Crescent," Miss M. I. Stone presented a paper upon "Mt. Waternomee," the Rev. A. A. Butler offered another depicting the features of Mt. Huntington, and the writer gave an account of Speckled Mountain in Batchelder's Grant, Me. In order to cross off the two remaining unexplored peaks from his predecessor's list, the Councillor visited North Woodstock during the last week of September, and thence traversed Mts. Blue and Cushman,—an account of which, together with several of the above-mentioned papers, in full or in part, is appended to this report.

Although many unfrequented spots among the mountains have already found their chroniclers, yet an examination of maps shows that there are a number of places that still await inspection, and many about which more accurate information is desirable.

---

#### SPECKLED MOUNTAIN. BY E. B. COOK.

LAST year, when in Chatham, the narrator's attention was devoted to Mt. Royce and the two peaks of Baldface Mountain. A sudden thunder-storm interfered with the reliability of the barometric observations made to determine the relative heights of the two peaks of Baldface. On the 28th of August, of the present year, my friend Mr. Peek and I walked through the Evans Notch to Chandler's, in Chatham; and on the following day we ascended Baldface Mountain,—the writer going also upon the farther peak, North Baldface, locally known as "Baldpate." A thick fog and heavy rain, with attendant atmospheric disturbances, interfered somewhat with our observations; but the digested result indicates that the northern summit rises about twenty feet higher than the more frequented peak of Baldface.

As the 30th of August was rainy, and the 31st was partially so, the clearing away of the storm made the 1st of September a glorious day for a mountain ascent. At a few minutes past seven in the morning, bidding good-bye to Chandler's, my artist friend and I rode to Johnson's, three miles on our way. At Johnson's begins the path through the Evans Notch; and there we parted, as my friend intended to return through the Notch, at present enriched with a superabundance of windfalls. My own route was to be over the top of Speckled Mountain, reaching Gilead by whatever way seemed most inviting.

From the summits of Mts. Caribou and Royce, Speckled Mountain shows many attractive features, which make one desirous of a nearer



acquaintance. Five, or more, rock-crowned ridges extend in various directions from the summit of the mountain. Three of these ridges run southward, two of them being between two and three miles in length. One leads down to the gate of the Evans Notch, another ends back of Johnson's farm-house, and the third terminates in a protuberance called Blueberry Mountain. The writer started on the middle and shortest ridge, which at first rises rather abruptly from Johnson's pasture. The trees on the way up present no obstruction, being birches, maples, and beeches, of no great age, with an occasional white pine. A climb of a very few minutes places one on a rocky outlook whence Royce, North and South Baldface, Eastman, and Little and Big Deer Mountains can be seen near at hand. The middle ridge up Speckled Mountain is composed of several rocky stretches, with intervening depressions of no great extent. On one of the crests stands a curious spruce-tree, which rears its head about eight feet aloft, and, the soil having been washed away from its former roots, they have become branches which encircle the base of the trunk like a wreath of juniper. The tree is bare between the foliage at the top and its wreath of lower branches, and the trunk is a little extended below the wreath, and has its more recent roots in the ground at its new level.

As some of the crags of the ridge leading up from the Evans Notch seemed to promise fine views westward, the writer left the middle ridge and crossed the intervening valley. As anticipated, the Notch and the rocky buttresses of Royce were seen to great advantage. As crest after crest along the ridge was surmounted, the view was continually changing and enlarging. Three hours and a quarter were consumed in traversing the enticing crags on the two ridges, and in enjoying the sights they offered. At a quarter before eleven the summit was reached, where a cairn of stones surmounted by a staff showed that the grand outlook had not been unvisited. One mass of rock a little overtops the surrounding stretches of disintegrating stone, which gradually slope away toward the various ridges leading downward. The readily crumbling rock is of granitic character; veins of red quartz and rough garnets occur, and the motley constituents naturally form a "speckled mountain." The ridges leading downward show long lines of bare rock going far down the mountain. The growth along the ridges consists mostly of diminutive poplars, birches, and spruces, which do not interfere with the outlook. From Chatham the easiest ascent would be up Blueberry Mountain, and along the bare, almost unbroken ridge which leads therefrom to the summit.

Next to Speckled Mountain stand Royce on one side, and on the other Red Rock Mountain, whose peculiar shape and rosy color are closely looked down upon. The view from the summit of Speckled Mountain is panoramic; and among the countless mountains that can be seen, are Red Rock, Pleasant, Kearsarge (North), Mote, Chocorua, Passaconaway, Tripyramid, Eastman, both peaks of Baldface, Carter Dome, Mt. Carter,

Royce, Moriah, Shelburne Moriah, Hayes, Baldcap, Percy Peaks, Stratford Mountain, Success, Carlo, Goose-eye, "Old Speck," Bear River Whitecap, Puzzle, Mt. Blue, Saddleback, Abraham, etc. Mt. Washington and Mt. Clay are seen nobly standing between the shoulders of Carter Dome and Mt. Carter; and the tops of Jefferson, Adams, and Madison rise pointedly over Mt. Carter. Twenty sheets of water can be counted, — among which one seems to identify the Upper and Lower Stone Ponds, Upper Kezar Pond, the Kimball Ponds, Kezar, Crotched, Upper Moose, Lovell's, and Long Ponds, Sebago Lake, and others. If the ocean was not to be seen, a bright glimmer on the horizon at least suggested it. From aneroid observations taken at Chandler's and at Gilead, the height of Speckled Mountain appears to be about 2,870 feet above the level of the sea. Its secluded position has prevented it from being as widely known as it deserves; but every mountain-lover who happens to be in its neighborhood ought not to fail to visit this very attractive eminence. The readiest way of going to Gilead was found to be by following the chief branch of Evans Brook, which has its source near the top of the mountain. In descending, a very impressive view was obtained of the desolation caused by the great gale of last December, which overturned so many trees in Chatham. On the ridge which runs down on the north side of the chief branch of Evans Brook, acres and acres of huge spruce-trees lie prostrate upon one another, — like very badly thrown giant jackstraws. The birches appeared to owe their downfall chiefly to the neighboring spruces, whose tall tops and wind-catching foliage caused them to uproot their insufficient attachment to the rocky soil. Several very pretty waterfalls were found along the brook. An hour and forty-two minutes were required from the summit to where the brook reaches the wood-road which connects with and forms part of the path through the Notch. Many fallen trees were encountered on the way down the brook. It took an hour to reach Hastings' clearing, from where the brook met the wood-road; and fifty-eight minutes thence to Gilead Station.

---

#### CRESCENT MOUNTAIN. BY MRS. L. D. PYCHOWSKA.

On the old map of Coös County there appear, in the township of Randolph, north of the Moose River, three ranges of hills, — one near the Moose, another near the Pond of Safety, and a third, bearing the name of Crescent, running up toward Berlin. On the Walling map (published in *APPALACHIA*, Vol. I. No. 3) these three ranges are very properly united into one. But there is still room for improvement, as the actual facts in the case are not yet accurately set forth.

Following the map and such information as we had gathered, we regarded this Randolph-Crescent Range as beginning with Boy (or Ball) Mountain, near the Mt. Adams House, and continuing in an easterly,

northeasterly, and northerly direction as far as into the township of Berlin, where Mt. Forist seems to make its northern termination, its eastern extremity being Sugar Hill, on the Androscoggin. But the question then arises, Where does Randolph Mountain end, and Crescent begin? We had supposed until recently that the height nearest to Randolph Hill, and on which stands the signal of the United States Coast Survey, was acknowledged to be the northerly summit of Randolph Mountain. Its height, by the most recent aneroid measurement, is somewhat over 3,108 feet above the level of the sea. From here to the depression containing the Ice Gulch, it is a distance of about one mile and a quarter. On the north side of this depression we presumed that Crescent Mountain properly began. The waving ridge-line running northward from this point is cut by ravines, one of them quite deep. It finally rises into the wooded summit generally known as Crescent, reaching an elevation of 3,220 feet above sea-level.

This arrangement of boundaries looks very plausible; but the fact seems to be that the older inhabitants applied the name "Crescent" to the height on which the signal is located. The idea conveyed by them is, that the Crescent Range runs through the township of Randolph; hence, while the mountains are Crescent, they are at the same time Randolph, as being in the above-mentioned township. The old map includes the Coast Survey summit in its line of Crescent Mountain, and the new one does not decide the question by the position of the names upon it. Hence there is a serious doubt as to the propriety of calling the said summit the north head of Randolph Mountain. We are informed that on the Berlin side the name of Black Mountain was formerly, and still may be, applied to a dark head of Crescent. We shall attempt no settlement of the relative claims of these names, but shall leave the final decision where it must of necessity fall, namely, upon the usage which will ultimately prevail.

Crescent is a mountain of secondary importance, easily overlooked in the presence of the giants standing on the opposite side of the Randolph valley; yet during four consecutive seasons Mr. W. H. Peek, of Chicago, has devoted such time as could be spared from loftier but not more difficult enterprises to the disentangling of the mysteries of that long undulating ridge which extends from the United States Coast Survey signal to the Androscoggin. His fervor having been communicated to our Councillor of Exploration and his party, the work has advanced considerably during the present season.

Some account of the height on which stands the Coast Survey signal, and a notice of the famous Ice Gulch, have already appeared in APPALACHIA (Vol. III. pp. 219-222). It only remains to say that a view down into the Gulch from the upper cliffs on either side well repays the slight exertion expended in obtaining it. The steep walls, crowned with spruces, and the strangely level floor, broken into huge boulders carpeted with the greenest of mosses and Alpine growth and dotted with the dark openings into the ice caverns, form a picture differing from any hitherto seen by

us among the White Hills. Moreover, the cliffs and slide found on the north side of the larger ravine of Mt. Crescent, north of the Gulch, are worthy of inspection. This slide is visible from the Randolph Hill road for a long distance. It is about one mile and a quarter from the head of the Gulch, in a direction nearly north by east. The cliffs, 150 feet high, overtop a deep ravine with wooded sides. At their base is a talus of broken rock, of about equal height. Along the top of the talus grow fir or spruce and birch trees, partly veiling the cliffs that rise behind them. The upper rocks are of a hard granite, the lower of a more friable species, probably resembling that found on the great slide at Tripyramid and on the top of Loon Pond Mountain. The slide is about 150 yards wide. The cause of the fall is apparently to be found in the character of the rocks. At the base is a hard granite or gneiss foundation, sloping at an angle of perhaps thirty degrees; on this lies the friable rock above mentioned, and above that a series of layers of hard granite blocks. When the friable granite has decomposed and fallen away, the heavy blocks above, having no support, fall, slip down the incline, and form the talus. Rain and frost do their work, season after season. The slide, now so plainly seen from afar, is of recent origin, and affords a sample of the large scale upon which the work of destruction is carried on. The decomposing granite, as it is washed down among the fallen rocks, forms a soil which nourishes the curtain of trees before spoken of. When this slide came down, a large number of trees fell with the earth on which they were growing, and their roots held in the upper fragments of the cliff till in some way fire got among them and left them black and half consumed. In climbing to the top of the cliffs, the exploring party used these blackened stumps and branches to aid in the steep ascent, which they made by way of the sliding gravel with its treacherous blocks.

From the top of the cliffs there is a fine prospect, embracing part of the Great Range, the Twins and Franconia Mountains, Cherry Mountain, and the hills near Lancaster and beyond in Vermont, the near-lying heads of the Crescent-Randolph Range, the Pilots, and others. Another set of cliffs, facing southwesterly, gives a view into the Safety Pond and Upper Ammonoosuc wilderness, bounded by Randolph, Pliny, Starr King, and Pilot Mountains. At the head of the slide a sign-board has been placed, bearing the name "Crescent Scar."

---

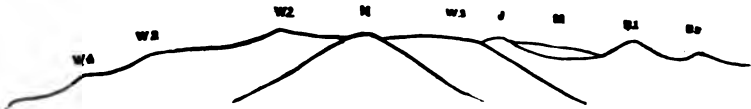
**MT. WATERNOMEE AND THE BLUE RIDGE. BY MISS M. ISABELLA STONE.**

THE name of Watnomée has long stood in the Club's list of unexplored mountains, — a list destined shortly to disappear before the indefatigable efforts of our present enthusiastic Councillor of Exploration.

Spending a few weeks this year, for the third summer, at the boarding-house kept by Mr. George F. Russell at North Woodstock, N. H., I

determined, under his escort, to climb Waternomee, undeterred by the statement that its summit was "densely wooded, and therefore of no interest to tourists." Osgood's Guide-book states that it lies south of Mt. Cushman, and 400 feet lower than Mt. Kineo. This is contradicted by the State map, which places Waternomee north of Cushman, but still quite near Elbow Pond. A few inquiries in the neighborhood elicited some information about Mt. Cushman, which we have reconnoitred in various directions; but nobody had ever heard of the desired mountain except the workmen on the Moosilauke foot-path, who, upon good authority, gave the name of Waternomee to a higher peak still farther north. For further knowledge it became necessary to go on to both these Waternomees, and also to look down upon the whole from the summit of Moosilauke.

Behind the Russell House, about twenty-five feet above the stage-road, is a plateau, from which is a beautiful view in three directions, including all the chief peaks of the Franconia Range. The accompanying rude profile, sketched from memory, represents the view looking due west, the mountains being nearly five miles distant. The Blue Ridge is the name ordinarily applied indefinitely to all these mountains, while Mt. Jim and Mt. Blue are frequently mistaken for Moosilauke; indeed, in certain states of the atmosphere, the three appear commingled. From the top of Moosilauke are seen, on the north, two other quite subordinate peaks, which belong to the ridge culminating in Mt. Blue [B 1], 4,533 feet in height. The three minor peaks are partly rocky, oddly shaped, — somewhat like the humps of a camel, — and all, as well as Mt. Blue itself, have a decided dip toward the south. To these four peaks, all in the town of Benton, it would seem best to restrict the name "Blue Ridge."



Mt. Jim [J] is the highest mountain in the township of Woodstock, 4,218 feet, and is south and a trifle east of Mt. Blue, from which it is separated by a long "sag," or shallow ravine. Over this is seen a portion of Moosilauke itself, namely, the northern end, over which one passes from the Tip-Top House to take the Benton trail down to Easton and Franconia. The true summit of Moosilauke, on which the hotel is located, is farther south, and hidden by Mt. Jim and Mt. Waternomee [W 1]. A topographical question arises whether Mt. Jim<sup>1</sup> should be considered as belonging to the "Blue Ridge," above-mentioned, in its restricted sense, or to the Waternomee ridge, or to neither.

Mt. Waternomee proves to be one long mountain, extending nearly north and south for almost four miles, with four crests separated by but

<sup>1</sup> The writer begs to disclaim all responsibility for this local name, which it is hoped will soon be changed for the better.

slight depressions. The two northerly crests are so nearly of a height that the eye can detect no difference; but the second one is calculated to be slightly lower. Waternomee 1 is 3,941 feet in height, according to the latest measurement of Mr. William Little; 4,096 feet, according to the record-book on the summit of Moosilauke. It is separated from Mt. Jim by a considerable ravine, which, however, is scarcely perceptible from the plateau at Russell's or from Moosilauke. The two southern crests [Waternomee 3 and 4] are much lower, and, approaching Elbow Pond, probably correspond to the Waternomee of the State map. Nameless Mountain [N] is lower than Waternomee and east of it. From Russell's it seems as if the peak of Nameless Mountain might appear from the other side, from the top of Moosilauke, peeping over in the depression between Waternomee 1 and 2; but it cannot be seen at all.

The Moosilauke foot-path begins at the house of Mr. Charles A. Smith in North Woodstock, and is said to measure seven miles and fourteen rods. It winds in between Nameless Mountain on the right and Waternomee 2 on the left, around the northeastern slope of Waternomee 1, and the northern side of Mt. Jim. On July 26, 1884, in carrying out our purpose of exploring Mt. Waternomee, we diverged from the Moosilauke path at the Three Mile sign-board, — that is, four miles up from the carriage-road, — and followed a compass line S.W. by S. through the trackless woods to the summit of Waternomee 2, noticing behind us, in the northeast, Lafayette, Liberty, and Flume Mountains, with their slides. We crossed a small stream, tributary to Walker Brook, for which the name "Waternomee Brook" is suggested. From the mossy cushion where we lunched, my companion "blazed" our return track to the Three Mile sign-board, — perhaps half or three quarters of a mile, — and here we nailed up a large board, painted white, bearing the black letters, "Mt. Waternomee," and an arrow pointing thither. Subsequent investigations lead me to the opinion — confirmed by Mr. E. B. Cook — that it would be better to move the sign half a mile farther up along the Moosilauke path. This change the writer proposes to make next summer.

The summit of Waternomee is wooded, chiefly with hemlock and spruce, of very little value, however; and two or three days' cutting would open splendid outlooks, which it is to be hoped the Club will assume the care of obtaining. Eastward we saw through the trees the peak of Little Haystack and its great shoulder sloping northward, scarred by the slides that entered Clear Brook; beyond this a distant range, looming up with the unmistakable majesty of Washington as its central figure; then Mts. Hitchcock, Upham, and Hancock, up the valley of the East Branch; and much nearer Loon Pond Mountain, and in the valley at its base the railroad and depot at North Woodstock. Westward could be seen the summit of Moosilauke, with its hotel, and glimpses of the grand Jobildunc Ravine between it and us, — what would have been a superb prospect but for the intervening forest. In the northwest rose a round-topped, dark, wooded mountain, quite near, which we afterwards found to be Mt. Jim.

On the clear morning of Aug. 13, 1884, at 9.30 o'clock, we left the summit of Moosilauke by the North Woodstock trail. At 10.30 we left the path, and, ascending southward up the northern slope of Mt. Jim, reached the summit in twenty minutes of easy climbing. It is covered with woods, through which a fair sight of the Lafayette Range was obtained. Here, having no A. M. C. bottle to deposit, we painted our initials and the date on a tree blazed for the purpose. Continuing southward, we descended a little and then rose again about as much, so that it is possible this latter point may be the true summit. My companion climbed a tree, sending down tantalizing exclamations about the fine prospect, while I took a compass-line as his hand pointed to Waternomee 1, bearing S E. We then descended the forest-clad southern slope of Mt. Jim, which was rough work, — over rocks, prostrate logs, moss-covered pitfalls, and through thick underbrush. Crossing the ravine, we ascended Waternomee 1, and at 12.15 stood on the summit, which is covered with a growth of firs. Among the landmarks we recognized in the distance Elbow Pond, across whose placid waters we had sculled in 1882 during a walk through the western wilderness between Woodstock and North Woodstock, crossing the old Mt. Cilley road, from whose deserted farms fine mountain views may be obtained. On Waternomee 1 we recorded our initials, as before, — discovering near by those of our two predecessors, — enjoyed our nooning, and then took a direct line down to the path, and so homeward.

---

#### THE ICE GULCH. BY WILLIAM H. PEEK.

THE earliest notice of the Ice Gulch known to the writer is to be found in "The White Hills," by T. Starr King (p. 256). It reads: "The sky along the northwest is cut by the grand outline of the Pilot Mountain wall. This ridge is remarkable for the splendid shadows from clouds that wander over it in the forenoons, when the northwest wind rolls heavy masses of the cumuli towards Mt. Washington. It has one other distinction, too, that should be known by all visitors of the valley. The deep chasm, which is plainly seen, in a clear morning, from the piazza of the Alpine House, cut about midway of the long battlement, and from which the cloud shadows that dip into it often spread each way upon the mountain, like the wings of a tremendous condor, is the only hiding-place we have ever found in the region, where the winter is not dislodged by the fogs and sun of August. The hollows under the rocks in the upper portions of the ravine are ice-houses that never fail. On the 8th day of September, 1858, the most oppressive day of the season in the Androscoggin Valley, the writer explored this cleft, and found its shadowed side so cold that it was dangerous to rest there, even for a few moments, — so chilly was the breath from the ice-blocks beneath the immense boulders, which the winter hides there in the hope perhaps of defying the sun yet with a *glacier* in New Hampshire."

While sojourning a few years since in Randolph, the present writer felt a strong desire to visit this interesting place, a desire not easily satisfied. Mr. King's description, while sufficient to excite curiosity, is vague and mysterious; moreover, I did not succeed in obtaining information or assistance from the people of the town, who were either ignorant of or indifferent to the existence of the remarkable place, which may yet prove to be one of the greatest attractions of the extremely interesting though hardly yet appreciated Valley of the Moose. But the next season a guide was secured in the person of Mr. Emory Watson, of Gorham, who, at the close of August, 1881, conducted a small party from Dickson's farm. By the north side of the opening (it can hardly be called a ravine) and by logging roads, sometimes thickly overgrown, and sometimes giving grand views of the noble chasm, we reached its western extremity. Our guide's reason for not entering the gorge from below was that many who had done so had become fatigued in climbing the rocks or boulders, and, being somewhat incredulous as to the existence of the ice, had returned with the belief that the whole story was worse than a delusion.

We descended a narrow rift, at first gently, but soon rapidly, when a small stream made its appearance, by the side of which we ate our lunch, before entering the body of the Gulch. This upper part we afterwards called The Vestibule. Descending still more rapidly, we entered a space with majestic cliffs, sometimes hidden by trees on either side, and covered with immense fragments of rock, beneath which our little stream at once disappeared. These rocks are spread over the floor, or piled one on another to an unknown depth, some moss-covered, some bare, but hiding large cavities, some of which we found it prudent to explore rather than to undergo the untried difficulty of climbing over or around them. It was cold enough, but we saw no ice. Soon, however, our guide, whose superior strength had left us behind, gave the cry "Ice!" and before we could reach the place, again and again, the cry "Ice, more ice!" resounded. We found plenty of it, hard as could be formed of compressed snow, with here and there a little stream trickling over or through it. The cliff walls showed in some places signs of recent rock-falls, and we shortly met with an obstruction caused by such a descent, where the huge stones, piled to the height of forty-five feet, had to be scaled. While on this eminence the writer noticed a great change from cold to heat, for the sultry air of the August day had found access to this slightly exposed situation. Looking back, the part we had left appeared to be roughly in the shape of a parallelogram, and we called it the First Chamber. Descending from our rocky eminence, which was of considerable length, we found another chamber, not unlike the first. In it much more ice was found. Here, too, the vegetation seemed scantier, and more of the rocks seemed of recent lodgement. Another obstruction, extending a much greater distance down the Gulch, was traversed, and we entered the third and last of the great enclosures, where the ice does not seem to tarry so long. This chamber—closed, as were the others, by a great transverse



wall — was separated, by a neck of rocks of about equal length with itself, from a smaller basin, called the "Dell of the Fairy Spring," at which spring the long-hidden stream shows itself for a moment surrounded by mosses and Alpine plants of exquisite beauty, but it immediately hides itself again beneath a low wall of boulders, to reappear at a short distance as a respectable brook, and one of the branches of that Moose family which has won the hearts of so many lovers of mountain, valley, and stream.

It would be wrong to dismiss this description of the veritable Dwelling-place of Winter, without calling attention to the beautiful cascade on the little stream, which has the name of Peboamauk. The streamlet has constantly gathered strength on its short course, and, now falling fifty or more feet over a ledge of rocks, forms an object of beauty scarcely inferior to any in the mountain region.

Another writer, more competent to the task, has given an account of the flora of the Gulch,<sup>1</sup> with some notes of the comparative times of flowering of some plants, here and near the summits of the Great Range. Attention is now merely called to the fact that in this place, at elevations above the sea-level from 1,800 to 2,300 feet, may be found a flora similar in character, but much later in flowering, to that on heights of 3,000 to 6,000 feet in the same latitude, or similar to the conditions of northern Labrador, at a latitude many degrees further north. This, with the fact that the whole Gulch, even to the Vestibule, is of a very low temperature, leads to the conjecture that a vast magazine of ice may be stored in the cavities of the space between the disappearance and the reappearance of the stream.

On Wednesday, Sept. 10, 1884, a visit was made to the Gulch by the Councillor of Exploration, and a chosen assistant, for the purpose of measuring the various parts, the writer attending for the purpose of testing carefully the difference in temperature of the different divisions.

	Feet.
The division called The Vestibule is in length . . . . .	480
Expansion of Vestibule . . . . .	660
First Chamber . . . . .	300
Separation . . . . .	166
Second Chamber . . . . .	300
Separation . . . . .	711
Third Chamber . . . . .	322
Separation . . . . .	295
Dell of the Fairy Spring to end of Gulch . . . . .	291
	<hr/>
	3,525
From commencement of open brook to Peboamauk Falls . . . . .	1,520
	<hr/>
Head of Gulch to Falls . . . . .	5,045
Making the whole distance a little less than a mile.	

<sup>1</sup> See APPALACHIA, Vol. III. p. 168.

The temperature of the air at head of Gulch was fully	80° F.
" " " at about half-way of Vestibule	64°
" " " at entrance to First Chamber	52°
" " " in First Chamber	54°
" " " at separation between chambers	70°
" " " in Second Chamber (coldest)	46°

Height of vertical cliff near head of Gulch. . . . . 95 feet.

Width of Second Chamber between vertical cliffs . . . . 250 feet.

This may be considered as the usual width except where heavy rock-falls above the separations have increased the width at the top.

The feeling which makes us desirous of sharing a good thing with our friends, especially when there is plenty of it, induced the writer to interest others in improving the means of access to the Ice Gulch, and the knowledge of it; and as the result of these efforts, it may be said that these cool recesses are now within the reach of ordinary pedestrians, and may be attacked from the Ravine House or the Mt. Crescent House without unnecessary expenditure of strength or time.

---

#### NOTES ON KTAADN. BY C. E. HAMLIN.

IN Mr. Witherle's excursion during the present autumn (1884) into the northern Maine woods, comprising a passage from Medway up the Mattagamon or east branch of the Penobscot to its head, thence across through the Sourdnaunk Mountains to the main Penobscot, and the descent of the latter back to Medway, he made some observations relating to Mt. Ktaadn which may properly be here recorded.

From the time of Thoreau to the present, canoeing upon the Mattagamon has almost invariably followed the stream downward from its sources. Borne rapidly by the current, and with backs turned toward Ktaadn, tourists have agreed in stating that the mountain is not visible from any portion of the river. In my "Routes to Ktaadn" (APPALACHIA, Vol. II. p. 327), I have myself made the same assertion. Mr. Witherle, both this year and last, went upward by boat from Medway, where the Mattagamon joins the Penobscot. Moving slowly against the stream and Ktaadnward, he has ascertained that the mountain is actually visible from the river at five points: namely, at Beton Ledge Falls; about half a mile below Rocky Rips; a mile and a half below and again half a mile above Whetstone Falls; and once more at the upper part of the river, some half mile below Stair Falls. A few rods on either side of these several points Ktaadn is wholly shut out from view.

Going from the solitary Trout Brook farm up Trout Brook to the head of Sourdnaunk stream, and down the latter to its junction with the Penobscot, — a distance reckoned at forty miles, — Mr. Witherle ascended three of the Sourdnaunk mountains. From the summit nearest to

Ktaadn, he saw on the west side of the northern end of that mountain a basin, hitherto unknown, walled in by precipices, like the two well-known basins, and with a small pond upon its floor. From Mr. Witherle's account of its position, I am inclined to think that the north wall of this newly discovered basin was seen by me from the northern summits of Ktaadn in 1879 and 1880, and again, at a less distance, in 1881, while passing from those summits along one of the spurs to the northern base. These cliffs are represented in my model of Ktaadn. From none of the points reached by me, however, could the walls at the head and on the southern side of the basin be seen, and therefore the existence of a basin was not suspected.

On returning to the Sourdnahunk stream from a partial ascent of Ktaadn upon its western side, before unattempted, Mr. Witherle came upon a ravine previously unexplored, of which he gives the following description: "We descended the steep side of the ravine by the aid of scrub, and found quite a brook at the bottom. We followed this down a steep descent; it grew deeper and wilder. Finally a sort of jumping-off place appeared, down which we climbed with difficulty and much risk. Here was a cascade at least seventy-five feet high, — a fine sight then, and of course very much finer in a wet time. Below this were more steep descents; and further down the brook was joined by a still larger one coming from another ravine of Katahdin. Looking back at the fall from below, shut in by the rugged walls of Katahdin on one side, and the lofty, bare, and perpendicular precipices of the smaller mountain on the other, this impressed me as the wildest and grandest spot that I had seen about Katahdin." Seen from the table-land of Ktaadn, the cliffs of the "smaller mountain" are very striking objects; and the lower part of the ravine is visible, but not its higher portion nor the cascade.

---

## Reports of the Councillors for the Autumn of 1884.

### Improvements.

BY WILBUR B. PARKER.

THIS department has not been as active in the building of new paths during the past season as it has been in previous years, but has directed its attention more to the preservation and improvement of some of those already constructed. A few short paths, however, have been added to our list.

Of these, one is to the summit of Humphrey's Ledge, near North Conway. It was suggested by the Rev. John Worces-

ter; and the expense, though exceeding the first estimate, was generously contributed in the summer of 1883 by Miss Ellen J. Baker, a member of the Club. It was marked out and cut early in September under the direction of Mr. William L. Worcester. It starts by a cart-road leading from the highway a little north of the gate through which one drives in going to Diana's Baths, crosses a pasture to a clump of woods, through which it passes, and soon enters another portion of the pasture. Here a spring of delicious water is found. It comes out of a partially decomposed ledge, in which we chiselled quite a basin. As we found plenty of water here, although the weather was very dry, we think there will always be a good supply. After passing the spring, the path again enters the woods by steps built over the fence. On the north side of the summit, vistas were cut in the trees, adding several beautiful pictures to the view. A guide-board of good size was nailed to the fence where the path leaves the highway, and at other necessary points on the route.

Mr. William G. Nowell reports that he and others, while camping between Mts. Madison and Adams, cut a short path, about one hundred metres in length, through the scrub-fir from Madison Spring to F3.3 ("John Quincy Adams"), and another, three hundred metres long, nearly west to Durand Ridge. Mr. Nowell also reports having carefully measured, with the assistance of his daughter, the Durand Ridge Path to Mt. Adams. He found the distance by Durand Scar to be 7<sup>k</sup>.12 or nearly 4 $\frac{1}{2}$  miles. Hectometer signs were erected as far as 4<sup>k</sup>.2, and kilometer signs for the entire distance. Besides these signs, he has some eighty more in various stages of preparation, to be erected next year.

New paths were made in Randolph, which are described below by our Councillor of Exploration. There will also be found appended a report of an improvement in the vicinity of North Woodstock, made by Miss M. I. Stone.

The heavy gale of last winter, which made so much havoc in the forests, caused a good many obstructions in the Club paths, and broke down the camps to a considerable extent, so

that a good deal of clearing and rebuilding was necessary. Arrangements were made by Mr. C. E. Lowe to repair the camp on the Mt. Adams Path, and to clear out the paths in that region. The camp in Tuckerman's Ravine was rebuilt, and the path between that point and Crystal Cascade cleared of the fallen trees by Mr. Jonathan Davis. We had hoped to have the Waterville-Livermore and the Mt. Carrigain paths put in thorough order early in the summer; but Mr. W. M. Sargent, who was engaged to do the work, found them in such a bad condition that he thought it unadvisable to begin the undertaking; consequently their condition is still such that strangers should not attempt to follow them.

---

**PATH TO GEORGIANNA FALLS. BY M. ISABELLA STONE.**

ON the Pemigewasset valley stage-road, at a point about two miles north of North Woodstock post-office, and three miles south of the Flume House, the traveller crosses Harvard Brook, flowing from the northwest and running east to empty into the Pemigewasset River. Half a mile north of this point, on the eastern side of the road, is the house of Mr. Stephen Russell, where a guide can be obtained for Georgianna Falls, described in Osgood's Guide-book as eighty feet in height, located on Harvard Brook, but rarely visited on account of the difficulty of traversing the pathless forest for nearly two miles. Directly after a heavy rain, when the brook is pouring away its high tide of life in merriest music, this is a delightful walk, extending through beautiful woods rich in botanical attractions, and ending in a short, steep clamber. Both below and above the Georgianna Falls proper there are numerous picturesque cascades, varying from three to fifteen or twenty feet in height. For the first one above, which is especially beautiful, I suggest the name "Harvard Cascade."

Formerly, to reach the cliffs at the top of Georgianna Falls, from which is an attractive prospect down the Pemigewasset valley, and for the best view of the falls themselves, we were obliged to fight our way through an intricate mass of fallen timber called "the burnt district," where hundreds of large trees, killed by fire, have rolled into the bed of the stream, seventy feet below, or are hanging over its precipitous banks. This summer a good path was cut through this débris; but the injury to the waterfall and its grand setting from the unsightly mass of dead wood is irreparable.

In 1877, from the point of intersection of Harvard Brook with the stage-road, a narrow path was "brushed out," following the course of the stream to the falls, but leaving untouched countless huge logs, which

afforded the pedestrian ample gymnastic exercise. From neglect this path soon became badly overgrown, obscure in places, and encumbered with fresh windfalls.

The majority of guests at North Woodstock in recent summers have considered this excursion a hard day's work,—once in the season being quite enough for nearly all, too much for many. Several persons wandering up the brook for a seemingly long distance returned firmly convinced that the lofty waterfall was a myth, and smiled at the gross exaggeration of certain enthusiastic mountaineers. The truth was, they had failed to reach the true Georgianna Falls at all.

During 1882, 1883, and 1884 the writer five times visited these falls, and has ascended far above them, exploring the upper course of the stream which rises in Bog Pond. Nearly half a mile below the pond is a series of interesting cascades, in a gradual descent for a considerable distance, making a continuous cataract. These we named "Upper Falls," painting the name on a tree blazed for the purpose. About half-way between its source and its mouth the brook entirely loses its impetuous character, and for perhaps three eighths of a mile spreads out into a series of pools, between which it almost disappears in tracts of marshy land. From the margin of one of them we obtained a fine view of Mt. Liberty. This part of the brook's course bears the local name of "the Bog Eddy."

Opposite the house of Mr. Stephen Russell, above-mentioned, is a grove, through which leads a broad path due west, the first right-hand fork of which the traveller should follow northwest—as directed by a sign-board—into an open field; thence nearly west, guided by a white-topped stake, to the edge of the woods, where there is a guide-board inscribed "Georgianna Falls, 1 mile 54 rods." By a mossy log the path crosses a tributary stream, passes through the woods westward till it strikes Harvard Brook itself, where it turns to the right, continuing up the left bank. Another sign is placed here. From this point the old path of 1877 was followed on account of its nearness to the charming brook. The present path continues to the falls, where is a large board bearing the name, and a smaller one inscribed "Bog Eddy,  $\frac{3}{4}$  mile;" it passes on for sixty-four rods through "the burnt district" and beyond to Harvard Cascade, which shall have a sign next summer if the name be approved or a better one offered. The present path, from the road as far as Harvard Cascade, made in the summer of 1884, is well brushed out, holes filled up, most of the logs chopped asunder or removed, and steps fixed for the others. In short, the work was done by Mr. William M. Sargent, now of North Woodstock, well known to many Appalachians as a skilled woodsman and a faithful worker.

Beyond Harvard Cascade to the Upper Falls, less was attempted, as few visitors would care to go so far. Other laborers were employed. A good blazed trail is made the entire distance; much of the way a narrow, rude path has been made. At the upper end of the Bog Eddy is placed a

sign, and another near by, directing to the Upper Falls, with the distance marked. At the Upper Falls we nailed a sign directing to "Bog Pond,  $\frac{1}{2}$  mile;" this distance is estimated, and is probably overrated. From this point the writer and one companion, on Aug. 7, 1884, with a light two-rod surveyor's chain, measured the entire route down to the highway, marking every quarter-mile on trees blazed for the purpose, and putting up the eight signs above-mentioned, prepared by the writer.

## DISTANCES.

From the road at S. Russell's to Georgianna Falls	1 $\frac{1}{2}$ miles 18 rods.
Georgianna Falls to Harvard Cascade . . . .	$\frac{1}{2}$ mile 24 rods.
Harvard Cascade to end of Bog Eddy . . . .	$\frac{1}{2}$ mile 16 rods.
Bog Eddy to Upper Falls . . . . .	$\frac{1}{2}$ mile.
Total . .	2 $\frac{1}{2}$ miles 18 rods.

According to the measurement of Mr. Sargent, the height of Georgianna Falls, to the first basin below, is sixty-seven feet. At the foot of the falls is a cave for shelter in case of rain. This summer, sixty-two rods below the falls, close to the path, a birch-bark camp was constructed.

## NEW PATHS IN RANDOLPH. BY MR. E. B. COOK.

1. LAST winter's logging operations very seriously obstructed the path from Randolph Hill to the Ice Gulch, so that Mr. W. H. Peek and a companion re-located the latter half of the way, thereby considerably shortening the distance. The entire path was subsequently well cleared by Mr. L. M. Watson and some of his men.

2. From the path to the Ice Gulch a trail was blazed by the same persons to the top of the north peak of Randolph Mountain.

3. Messrs. W. H. Peek and George A. Sargent have marked a trail, for future cutting, leading from the foot of the waterfall in the Gulch to Randolph Hill.

4. Mr. Hubbard Hunt has completed the Castellated Ridge Path by cutting an excellent way from the junction of the Ravine of the Cascades and the Ravine of the Castles to a point opposite his own house.

5. Mr. Hunt has also cut a path from his house, tapping the path from the Ravine House to the Pond of Safety, at the depression south of the south peak of Mt. Randolph.

6. Mr. Hunt has, moreover, opened a way from his house to near the point where Lowe's Mt. Adams and King's Ravine Paths diverge.

7. Mr. Peek and the writer have spotted a line — to be opened next season — which shortens the path to Mt. Adams *via* Durand Ridge, by going directly up the ridge, instead of following the turns of Snyder Brook.

8. A path half a mile or more in length, passing over the north peak of Mt. Carter, was cut by Mr. Hunt, under the supervision of the writer, on the occasion of a visit for the purpose of clearing an outlook for the projected Appalachian excursion made on the 16th of September.

## Proceedings of the Club.

May 14, 1884. — Fifty-seventh Corporate Meeting.

Professor Charles E. Fay in the chair.

THERE were present about eighty persons. Ten candidates for membership were nominated, and the seven presented at the last meeting were all elected.

Upon the recommendation of the Committee appointed at the last regular meeting, it was —

“ *Voted*, To put upon record this expression of our sense of the great loss which geographical science has sustained in the death of Dr. Ernst Behm, — recently elected a Corresponding Member of the Club, — whose devoted labors have so efficiently aided in the dissemination of knowledge in this department, and won for him a world-wide recognition as a leading authority in geographical studies.”

The Chairman stated the arrangements which had been made for the May Walk, Saturday, May 17. (See p. 92.)

The Recording Secretary announced that the Council had voted to arrange an excursion to Mt. Tom, June 17, and a Field Meeting at Newport, Vt., to be held probably in July.

Professor E. C. Pickering presented a paper entitled “ A Photographic Study of the Matterhorn.”

Professor Pickering originally intended to make a collection of photographs and panoramic views among the Alps. The distant mountain views, however, proved so unsatisfactory that he directed his attention to the nearer views, and to the application of photography to surveying. He had selected the Matterhorn as an example, and was at work constructing a map. After explaining the method applied in making a map from photographs, he exhibited a fine collection of views of the Matterhorn, taken from various points of the compass. With the help of these photographs he described the leading characteristics of the peak, made many interesting comparisons, and mentioned the most noted ascents.

Professor Fay spoke of the great value which this proposed map will have ; it being, so far as he was aware, the first attempt to construct an accurate map wholly from photographs. He also raised the question whether a mountain presents the same effect of outline from two points on exactly opposite sides.

Professor Pickering thought that the outline would be the same only in case the points of view were at a considerable distance from the mountain.

Mr. J. R. Edmonds mentioned the desirability, from a topographic as well as artistic standpoint, of increasing our collection of White Mountain photographs.



June 11, 1884. — Fifty-eighth Corporate Meeting.

President Scott in the chair.

Sixty persons were present. Ten new members were elected, and nine nominations to membership were presented.

The Corresponding Secretary read a circular received from the Oesterreichischer Touristen Club, announcing the opening under its auspices of four new refuges (Club-hütten) among the Austrian mountains, and inviting the members of other Alpine organizations to avail themselves, when travelling in these regions, of the railway rates accorded to members of the Oesterreichischer Touristen Club, as well as of the privileges of their refuges.

A fine series of photographic views in the Tyrolese Alps, received as a gift from the Società degli Alpinisti Tridentini, was exhibited and commented upon by the Corresponding Secretary; a vote of thanks was passed to the Society for this valuable gift.

The following amendment to the By-laws, due notice of which had been given to all the members, was passed to a second reading: —

“ Amend Art. XI. by adding, ‘ A quorum of the Council shall not be less than five.’ ”

An announcement was made concerning the proposed trip to Mt. Watatic, substituted for the excursion to Mt. Tom, on June 17. (See p. 93.)

A paper by Mr. George H. Witherle, entitled “ The Sourdnaunk Mountains,” was read by Professor C. E. Hamlin. This group of mountains is reached by ascending the West Branch of the Penobscot to the Sourdnaunk River. Mr. Witherle ascended several of the peaks, and in his paper describes the views which he obtained. He also ascended Mt. Ktaadn by the slide on the southwest side. The return trip was by Millinocket Lake and River. The paper contained valuable information for those who wish to visit this interesting region. (See p. 20.)

President Scott read a paper entitled “ Notes taken on a Recent Trip to Black and Roan Mountains, North Carolina.” He gave an account of his ascent of these two mountains, described their character and the views they command, and mentioned the beautiful flora and magnificent forests of hard timber. He also alluded to the difficulties incident to a trip in this region, and mentioned the contemplated improvements which will render the mountains easily accessible to a large party.

The next subject discussed was “ The Mountains near Lakes Willoughby and Memphremagog.”

Mr. J. R. Edmands, with the help of a map, described the geographical features of northeastern Vermont, especially dwelling upon its interesting hydrography, and pointing out the lakes and rivers and the different mountain ranges. He also showed upon the board a profile of these mountains as seen from Mt. Starr King in New Hampshire.

Professor C. E. Fay then gave an account of a trip to this region made

by Mr. Edmands and himself, in September, 1883, for the purpose of doing topographical work in the vicinity of Mt. Burke. He mentioned the striking view of Lake Willoughby from Mt. Annanance, and described in detail the view from Jay Peak.

July 9, 1884. — Seventeenth Field Meeting.

Held at the Memphremagog House, Newport, Vt.

Professor E. C. Pickering in the chair. Forty persons were present.

Professor C. E. Fay, Chairman of the Committee, announced the various excursions which had been arranged. (See p. 93.)

Mr. J. R. Edmands presented a paper on the topography of the Lake Memphremagog region, describing in detail the views from Orford, Owl's Head, and Jay Peak. Professor Pickering remarked upon the appearance of the Adirondacks as seen from the Green Mountains.

Upon request of the Chairman, Mr. William H. Ladd took the chair, and Professor Pickering proceeded to make some remarks upon the "Effect of Mountains on Rainfall." The subject had been called to his attention, as related to the work of the Club, by Professor Cleveland Abbe, of the U. S. Signal Service. He stated that the rainfall upon the summit of Mt. Washington was about twice the total fall at adjacent New England points, and that observation at different heights on the side of the mountain showed that the amounts varied as the heights. In order to further the study of this subject, it is desired to obtain regular observations at different points in the White Mountain region; and Professor Pickering suggested that the members of the Club should endeavor to interest the residents in the subject. He exhibited a rain-chart of the world, and called attention to the fact that the regions of heaviest rainfall were those of the Himalayas, Andes, and Alps. The warm winds from the sea are cooled by the mountains, and the moisture is precipitated in the form of rain. The rainfall is small, however, on the southern Andes, and on Mt. Whitney in California, since the winds in those regions are dry. Such mountains would therefore make good stations for astronomical observatories.

Professor S. P. Langley said that on Mt. Whitney huge logs can be found, three thousand feet above the line of vegetation; these are relics of some primeval forest, and show that great climatic changes, involving the change in rainfall, have taken place.

Professor Langley also described the "Spectre of the Brocken," as seen by him and two companions on Pike's Peak. Just as the sun began to sink, they saw, on the mist in the east, a bright halo, and themselves in it. He thought it was near and not very large, and would call it a shadow were it not for the halo. He saw no reason why the phenomenon should not be seen in the White Mountains.

It was stated by a member of the Club that this phenomenon was seen with a double halo on the summit of Mt. Washington in August, 1852.

In reference to the logs on Mt. Whitney, Professor Pickering remarked that changes in temperature are constantly going on; and that the shortening of the glaciers among the Alps was probably due to the small rainfall years ago, since the glaciers seem now larger than formerly at the top.

Mr. J. Rayner Edmonds then opened a discussion on "Accuracy and Exaggeration in the Reproduction of Mountain Landscapes." The artist, he said, has one of three objects in view: he may paint an imaginary landscape, or he may wish to convey a good idea of a country not yet seen, or to recall a view formerly seen. By the camera we find that the artist has a glaring tendency to exaggerate the vertical, and the result is often unpleasant to those familiar with the object. All we ask is that he shall bring back the original to our minds as we saw it.

Professor C. E. Fay thought that in discussing the question how pictures should be made for us, it is the seeing subject which should be considered first of all. We do not see alike; hence the trouble. The ordinary man does not see as the skilled observer does. It is indispensable that things should appear, not necessarily accurate, but natural; and it is therefore necessary for the artist to represent things, not as they are, but as they appear to the average man. He must paint what we see, and not what is seen; in other words, the painting must represent the average beholder's interpretation, after the mechanism of sight and the judgment have intervened.

#### September 12, 1884. — Eighteenth Field Meeting.

Held at the Alpine House, Gorham, N. H.

Rev. Henry G. Spaulding in the chair. Sixty persons were present.

A few remarks were made by the Chairman on the attractions of the Gorham region.

A paper on "Mt. Huntington" by Rev. Alford A. Butler was read by the Chairman. (See p. 40.)

A paper on "Crescent Mountain" was presented by Mrs. L. D. Pychowska. (See p. 73.)

Mention was also made of various improvements during the season upon the mountains in the vicinity of Randolph; and the paper was supplemented with a poem by Miss Edith W. Cook, entitled "The Logging Road," — a vivid description of the temptations and dangers of that "bewildering promise of a pathway."

Mr. E. B. Cook read a paper on "Speckled Mountain." (See p. 71.)

Miss M. I. Stone presented a paper on "Mt. Watnomsee." (See p. 75.)

A paper by Mr. William H. Peek, on the "Ice Gulch in Crescent Mountain," was read by Mr. James R. Carret. (See p. 78.) Through the efforts of Mr. Peek a path to the Gulch has been made during this summer.

Mr. William H. Nowell described his camp life this summer at Madison Spring, and mentioned certain improvements which he had made on that part of the Presidential Range.

Mr. J. R. Edmands, Chairman of the Committee, announced the details of the excursions which had been arranged in connection with the Field Meeting. (See p. 93.) He also made some remarks concerning mountain nomenclature and the signals of the Coast Survey, and distinguished between the two Speckled Mountains, of which the northern one is called "Old Speck."

Mention having been made of certain advertisements upon rocks, it was voted, upon the motion of Mr. W. G. Nowell, that the Council be requested to take such action as may seem best concerning the disfigurement of rocks by signs.

Rev. Mr. Jerome, of the Congregational Church at Gorham, also made a few remarks, extending hospitalities to the members of the Club.

October 8, 1884. — Fifty-ninth Corporate Meeting.

President Scott in the chair.

About sixty-five persons were present. Nine members were elected, and twenty-three nominations to membership were presented.

The Corresponding Secretary announced that the proposed Congress of Alpine Clubs at Turin had been indefinitely postponed; and that the delegate of the Club appointed by the Council had been unable to attend the Convention of the Deutscher und Oesterreichischer Alpenverein at Constance, Switzerland.

The following amendment to the By-laws came up for final action, and was adopted by a unanimous vote:—

"Amend Art. XI. by adding: 'A quorum of the Council shall not be less than five.'"

A paper by Professor George Davidson, entitled "Account of the Volcano Makushin, on the Island of Unalaska, in the Aleutian Chain," was presented by Professor E. C. Pickering. (See p. 1.)

Dr. J. F. Frisbie gave an account of "A Tramp over Ossipee Mountain." His course was from Melvin Village over to Lovell's River. He described the range and the view from the top.

Professor C. E. Fay announced that an excursion was being arranged to the Lake Winnepesaukee region and to Ossipee Park, on the side of Ossipee Mountain. (See p. 94.)

Mr. Samuel H. Scudder presented a paper entitled "The Movement of the Hôtel des Neuchâtelois on the Glacier of the Aar." He explained Agassiz's theory of glaciers, and gave an account of his experiments. The greatest movement of the glacier in one year was found to be eighty-seven metres; the average movement, fifty-five metres. Mr. Scudder reported that a piece of the large rock under which Agassiz built his cabin on the glacier of the Aar, over forty years ago, was found during the past summer, being identified by the markings upon it in red lead.

November 12, 1884. — Sixtieth Corporate Meeting.

President Scott in the chair.

About sixty persons were present. No nominations for membership were presented, the Council having failed to meet; twenty-three new members were elected.

A set of photographs taken from the summit of Humphrey's Ledge, Bartlett, N. H., a donation of Miss Ellen J. Baker, was exhibited by the Corresponding Secretary.

It was voted that the President be requested to appoint a committee of three to nominate officers for the ensuing year. The President subsequently appointed Professor W. H. Niles and Messrs. C. W. Kennard and C. A. Wellington.

It was also voted that the President be requested to appoint the usual Auditing Committee. The President subsequently appointed Messrs. R. F. Curtis, H. C. Dodge, and G. M. Jones.

The report of Dr. W. B. Parker, the Councillor of Improvements, was read by the Recording Secretary. (See p. 82.) Professor C. E. Fay made some remarks upon the desirability of building camps which should be more permanent. President Scott thought that shingles might be used for the roof instead of bark, but hoped that the open log camp would be retained.

Mr. J. R. Edmands presented his report as Councillor of Topography.

Mr. Samuel H. Scudder exhibited a map of Baltimore presented to the Club by the Johns Hopkins University Field Club, under whose auspices it was prepared; also a few photographs taken by Mr. Gardiner H. Scudder at Moosehead Lake.

Mr. Scudder then presented a paper entitled "The Alpine Club of Williamstown, Mass." (See p. 45.)

The report of Mr. E. B. Cook, the Councillor of Exploration, and a paper by him on "Mts. Blue and Cushman," were read by Mr. Byron Groce. (See pp. 70, 34.)

---

### Excursions of the Season of 1884.

A PARTY of about one hundred and twenty-five visited **TURKEY HILL**, between Arlington and Winchester, Saturday, May 17. The train left the Boston and Lowell Station at 1.35 P. M., and at 2.05 arrived at the Forest Street Crossing in Arlington, where the party alighted in the midst of a shower. The sun, however, soon appeared, and the remainder of the afternoon was quite pleasant. The walk was by road to the hill, and then through the pine woods across the fields, and along the shore of Mystic Lake to Mystic Station, a distance of less than four miles. The view from the hill was very good, the air being clear enough to render

Mts. Wachusett and Monadnock visible. About twenty-five availed themselves of the barges, and a few rode as far as West Medford. The party returned to Boston on two different trains, arriving at 5.23 and 5.51 P. M.

On Tuesday, June 17, about fifty members and friends made an excursion to MT. WATATIC, in Ashby, Mass. The party left Boston at 8.30 A. M., arrived at Fitchburg at 10, and were conveyed thence in barges to the base of the mountain, a distance of nine miles. Lunch was eaten under the trees, and then the mountain was ascended. The chief objects of interest were Mts. Wachusett and Monadnock; but great beauty was given to the view by the numerous lakes. On account of haze, distant points were not visible. Although the day was exceedingly warm, there was a good breeze from the west. In returning to Fitchburg, stops were made to gather mountain laurel. The party reached Boston at 6.40 P. M.

In connection with the Field Meeting at Newport, Vt., an excursion was made on LAKE MEMPHREMAGOG, Wednesday afternoon, July 9. Owl's Head and Orford were clear, but clouds obscured the higher mountains. On Thursday, at 8 A. M., a large party left Newport in carriages for JAY PEAK, and twenty-three — nine ladies and fourteen gentlemen — climbed to the top. The weather was delightful, the sky being clear and the air cool. The view of the Green Mountains was very fine; the White and Franconia Mountains came out clearly, and the mountains of southern Canada and northern New Hampshire were very interesting. The Adirondacks were somewhat obscured by haze. The party reached Newport at 9.30 P. M. On Friday, fourteen — seven ladies and seven gentlemen — ascended OWL'S HEAD. The day was fine, although the sun was quite warm and the distant view somewhat obscured by haze. The view of Lake Memphremagog was very beautiful. The ascent took about two and a half hours, and the descent one and a half, both being made very leisurely. On Saturday, nearly all went to LAKE WILLOUGHBY, riding by stage from Barton to the foot of the lake, where the steamer was taken. As the boat passed up the lake, the view of the cliffs which form the Notch was very fine. Nearly all remained at the Wiloughby Lake House over Sunday, and many for several days, during which ascents of Mt. Annanance and Bald Hill were made.

In connection with the Field Meeting at Gorham, N. H., a party of thirty-two drove to BERLIN FALLS, six miles, and to the Heights, three miles beyond, on Friday, September 12. A fine view of the mountains of northern New Hampshire and western Maine was enjoyed. On Saturday, September 13, four ladies and seven gentlemen climbed BALD CAP, leaving Gates Cottage, in Shelburne, at 10.45 A. M., and reaching the signal on the southern summit at 1.25 P. M. A fine view to the south was enjoyed, the Moriah-Carter Range being especially interesting. The temperature was  $89\frac{1}{2}^{\circ}$  Fahr. Nine of the party also visited the pond

which lies between the two summits of Bald Cap, and enjoyed a view of Mount Madison rivalling that from Lead Mine Bridge. A party of twenty-two spent Saturday in visiting GLEN ELLIS FALLS and CRYSTAL CASCADE. During the week spent at Gorham drives were taken to Lead Mine Bridge and Randolph Hill, and quite a number of the company ascended Mt. Hayes. On Monday morning, twenty-five — nine ladies and sixteen gentlemen — ascended MT. SURPRISE, leaving the Alpine House about 11 A. M. and reaching the top about 1 P. M. Fourteen of this party, including four ladies, continued their climb, and reached the summit of Mt. MORIAH at 5.05, two and a half hours from Surprise. Monday and Tuesday nights were passed in camp near the spring, a few rods below the summit. Early Tuesday morning a heavy rain fell for several hours; but during the remainder of the time the weather was pleasant, though hazy. A fine sunrise was enjoyed Wednesday morning; the temperature was then  $44\frac{1}{2}^{\circ}$ . On Tuesday a party of gentlemen left camp at 10.30, passed Imp Mountain, and reached Mt. Carter at 1.30; while another party, including ladies, left camp at 10.35 and reached the great rock on Imp at 1.30. Fine views were enjoyed of the Presidential Range and its ravines. Wednesday morning the company separated into two parts. Ten, including two ladies, left camp at 9.20, and, passing over Middle Moriah, reached Shelburne Moriah at 1.15; after a stop of an hour the descent was made by the Rattle River, reaching the road at 4.45. The remainder of the party dined at camp, and descended in the afternoon by the way of Mt. Surprise.

On Saturday, October 11, a party numbering about ninety visited LAKE WINNEPESAUKEE and the adjacent region, leaving Boston in special cars by the morning express over the Lowell Railroad. Fifteen of the company left the train at Laconia, and after a pleasant drive of four or five miles made the ascent of MT. GUNSTOCK (Belknap), at the southern end of Lake Winnepesaukee, from which a pleasing view was obtained. The main portion of the party, leaving the cars at Weirs, enjoyed a fine sail by the steamer "Gracie" and her barge for some fifteen miles to Clark's Landing, at the upper end of the bay, beyond Moultonborough Neck. Here the party divided, about half returning to Weirs by the "Gracie" and thence by the evening train to Boston, being joined at Laconia by the mountain party. The remainder continued their trip to OSSIPEE PARK, the summer residence of Mr. B. F. Shaw, a life-member of the Club. Two or three days were spent under his hospitable care in enjoying the views of mountain, lake, and forest in the Park and its vicinity. The autumnal foliage was at its best, and presented effects of color surpassing anything that the Club had previously seen. The view from the summit of the Shaw peak of Ossipee Mountain, though confined to the nearer landscape, owing to the misty atmosphere, was exceedingly rich and beautiful. The greater number returned to Boston on Monday afternoon by the same route taken in coming, some, however, making a detour by Moultonborough and Centre Harbor.

On Saturday afternoon, October 25, notwithstanding the postponement of the excursion on account of the unfavorable weather, a party of about thirty visited MOOSE HILL, in Sharon. The afternoon proved more pleasant than it promised; and while not very clear, the view from the tower on the summit of the hill was enjoyed by all, especially as the autumnal colors were still brilliant. The following Saturday proving even less favorable, the excursion of the Club was indefinitely postponed.

---

### Members added since April 20, 1884.

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| Betts, Miss Helen L., Jamaica Plain. | Lund, Miss Annie M., Charlestown.     |
| Briggs, Alonzo H., Boston.           | Lynde, A. Selwyn, Melrose.            |
| Bullock, Edwin O., Wellesley Hills.  |                                       |
|                                      | Magwood, Robert H., Boston.           |
| Chamberlin, C. O., Wells Beach, Me.  | Marsh, Miss E. L., Boston.            |
| Clay, Charles M., Boston.            | Merrill, George K., Boston.           |
| Cornstock, Miss F. A., Castine, Me.  | Moore, Eugene H., Boston.             |
| Conant, James S., Boston.            |                                       |
| Cross, H. B., Jamaica Plain.         | Nevins, Winfield S., Salem.           |
| Cunningham, F. H., Roxbury.          |                                       |
| Cushman, Walter S., West Newton.     | Perkins, Walter B., Lowell.           |
|                                      | Perrin, Miss M. B., Brookline.        |
| Draper, Chas. N., Canton.            | Potter, H. A. L., Jr., Providence.    |
| Drumm, Thos. J., Concord, N. H.      |                                       |
|                                      | Ricker, Edward P., So. Poland, Me.    |
| Ellis, Miss Lucy, Boston.            | Rotch, A. Lawrence, Boston.           |
| Endicott, Frederic, Canton.          |                                       |
| Ford, Miss Florence G., Duxbury.     | Sampson, Mrs. F. D., Newton.          |
| Frothingham, Miss Ellen, Boston.     | Sampson, Miss J., East Boston.        |
|                                      | Saville, C. M., Medford.              |
| Gleason, Miss Mallie F., Milford.    | Smith, Fred. M., Boston.              |
|                                      | Souther, Miss E. A., Quincy.          |
| Hastings, Mrs. C. E., Boston.        | Sprague, Isaac, Jr., Wellesley Hills. |
|                                      | Swan, William U., Mattapan.           |
| Jenney, A. S., Brookline.            |                                       |
| Johnson, Mrs. G. E., Boston.         | Tolman, Miss Anna, Hanover.           |
|                                      | Tucker, Miss Emily J., Charlestown.   |
| Kimball, Miss Helen, Longwood.       |                                       |
|                                      | Wakefield, A. T., Cambridge.          |
| Leavitt, John E., Boston.            | Webber, C., Boston.                   |
| Leslie, Mrs. G. R., Wells River, Vt. | Webber, Walter I., Boston.            |
| Littlefield, Walter F., Cambridge.   | Witherle, Mrs. G. H., Castine, Me.    |
|                                      | York, Mrs. M. E., Boston.             |









LEWIS ENGRAVING COMPANY.

THE ZINAL ROTHORN.

[See Note, page 101.]

# APPALACHIA.

---

VOL. IV.

BOSTON, JULY, 1885.

No. 2.

---

## Ascent of the Zinal Rothhorn.

BY FREDERICK HASTINGS CHAPIN.

Read May 18, 1885.

IN 1877 I was in Switzerland, walked over the important passes, and ascended the Breithorn at Zermatt and Mont Blanc at Chamonix. This experience strengthened a love of mountains early awakened by Mounts Tom and Holyoke, and Connecticut hills. The summer of 1882 found me once more in the Pennine Alps; and after a few excursions in the neighborhood of Chamonix, I hurried to Zermatt. Here one bent on mountaineering can find anything to suit his fancy,—steep rock-climbs or long snow-mountains.

It was not until 1841 that much was known of this district; and of the more difficult rock-peaks, none were ascended until Professor Tyndal climbed the Weisshorn in 1861; Mr. Kennedy, the Dent Blanche in the same year; Leslie Stephen, the Rothhorn in 1863; and Mr. Whymper, the Matterhorn in 1865. These peaks are of a class entirely different from Mont Blanc, Monte Rosa, and other snow-domes, although, perhaps, no more dangerous if the amateur be in the hands of good cragsmen for leaders; but to enjoy rocks most thoroughly, he must be in training. The dangers of Mont Blanc are real and great, but can generally be reduced to a minimum when every precaution is taken. Crevasses are numerous, but with proper use of ropes are apt to lose their terrors. Sudden storms and violent winds

arise near the final ridge of Mont Blanc, and one party is thought to have been actually blown from this arête leading to the top. One of the saddest moments of my life was at this point, when after tramping for five hours we were obliged by the strong wind to turn our faces toward the valley and retreat, with the summit seemingly so near at hand; but the mild day following gave us the victory. There is hardly any place, however, on this mountain where a slip, pure and simple, would be fatal to a whole party roped together. When making the ascent of Mont Blanc in 1877, while we were going up a steep snow-slope, our leading guide fainted. I was next to him on the rope, following in his tracks (we were about eight feet apart). He glided by me like an ice-boat. The rear guide, really our best man, caught him; and as all of us dug our axes and alpenstocks deep into the snow, we held him, and were saved even from a slide down into a snow-bank, or perhaps into a crevasse; but a slip of this kind on any difficult rock-mountain (by which I mean a peak too steep for snow to lie on) would have been fatal to the whole of us, — seven in number.

I will venture to give the readers of APPALACHIA an account of my climb up the Rothhorn, a peak 13,855 feet in height, — 8,540 feet above the village of Zermatt.

I left the village at 4.30 o'clock in the afternoon of the 24th of June, in company with Joseph Imboden, of St. Niklaus, as first guide. He had been engaged by an English climber for ten days; but having made an ascent of the Unter Gabelhorn the day before, this gentleman was willing to rest for a couple of days, and kindly loaned Imboden to me. I had known of him long, having seen his name frequently in the "Alpine Journal." He led the party that made the first ascent of the Lyskamm from the Italian side. He chose, as second guide for me, Peter Knübel, a well-known Valais man, of a family now famous through the accident on the Lyskamm in 1877, when he lost three brothers by the giving way of a snow cornice, whereby they were precipitated to the glacier below.

Peter and a porter had gone, an hour before us, with

blankets and provisions, to the sheltering rocks near the Trift glacier. We followed the Triftbach for three hours up from Zermatt, and in half an hour passed the last châlet. This district seemed to me wilder than anything I had seen before in Switzerland; there was not a habitation anywhere along the banks of this torrent. The only living things seen after getting out of sight of Zermatt are a few sheep, but on this occasion not even a shepherd welcomed us. In about two hours we met our porter returning homeward, having left the provisions, etc., at the rocks; and at 7.30 o'clock we reached our sleeping-place, under a shelving ledge several hundred feet above the left bank of the torrent of the Trift. It was a very tolerable shelter; and although rain began as soon as we arrived, we were in a perfectly dry spot, the rocks projecting about fifteen feet, and protecting us entirely from the rain. Down through the rocks a little stream of pure cold water trickled, which would fill a small drinking-cup in a minute; and with this water Knübel was already making some chocolate. He had brought some branches from the last pine-trees, far away below, for the fire. For supper we had cold meat and bread and honey; and at 9.30 o'clock we turned in, Imboden and Knübel with their pipes in their mouths.

The rain now came in gusts; thunder rattled and boomed, and lightning played in a lively manner around the cliffs of the Gabelhorn. The rain was thickest toward the Zermatt valley. It seemed hours before I got to sleep; then I was awakened by Knübel's striking a match and remarking "Half past ten," which made me smile all by myself in the dark. We lay side by side, wrapped in blankets; the fire going slowly out, but its dying embers sending out sparks enough to burn a hole in my coat and several in the blankets. I lay awake for a long time after this; but in about an hour it began to brighten, the moon came shining through the clouds, and then I caught sight of two faint stars, and then Antares itself, creeping along just above the notches in the ridge which connects the Gabelhorns (Unter and Ober). A light breeze dispersed the wreathing clouds, or packed them down into the gorges below; the whole sky cleared, and in the pure moonlight I could see all the peaks between Monte

Rosa and the Dom on the east side of the Zermatt valley. Extremely satisfied with the change in the weather, I fell asleep once more, and slept soundly until awakened by Knübel's raking up the embers of the fire; he soon had coffee and tea brewing, and after a slight repast we were off at 2.30 A.M.

Imboden led; I went next, and Knübel followed. In a few minutes we were off the grass slopes, and began on an old moraine, which led up between the Trift and the Rothhorn glaciers. This we followed for about an hour. We then roped ourselves together, and started to cross the glacier. The snow was in good condition so early in the morning; and we made quick work of it until we came to the snow arête of the Rothhorn, when it became much steeper, and I rather wished to call for frequent halts, but managed to keep up without making my wants known. The arête is very narrow, and, for a new man in such a place, rather ticklish. I carried my axe till I came to the foot of the rocks of the peak proper, but my inclination was to crawl in some places. The arête came up to a feather edge with very steep slopes on both sides, and occasional rocks jutting up, but not enough for much of a resting-place. Steps had to be cut more than half of the way. The view of the Monte Rosa chain from this point was grand, and from mere size and mass overwhelming. At about six o'clock we began on the rocks, and here I left my axe; in fact, I could not carry it farther, and the guides slung theirs over their shoulders. The very first place appeared to me impossible to ascend; the rocks rounded above us so that I could not see their edges, and the snow slopes ran off beneath at a fearful angle. In a minute Imboden was up about twenty feet, or the length of the rope between us, and said, "Kommen Sie." He spoke English fairly, but Knübel only the patois of the valley. By support from Imboden and the rope, I was able, by scrambling and clawing, to get up to him, and then I did not have much of a hold. I asked Imboden if there were any worse places; he said, "Wait and see; but I shall laugh at you if you are afraid." This was the place which stopped the first climbers that tried

to conquer the mountain in 1862; and they had Tyndal's famous guide, Bennen, who was afterward killed by a snow-slide on the Haut de Cry. After fifteen or twenty minutes' work on the rocks I was so impressed with the ability of my guides that I gained confidence; and the higher up we got, the less fear I had of the precipices and steep snow-slopes below.

The Rothhorn is divided near the summit into three peaks, hardly discernible as such from below or from distant points, although it sometimes appears as two. One of these we went over; the other must be rounded. We were standing on a ridge looking down on the west side, which had been in view all the time. It seemed bad enough, — nearly precipitous for a thousand feet, and then the snow-slope; but the northeast side, which I now looked down for the first time, was terrible, — about twenty-five hundred feet, to all appearance a vertical, — and we must cross the face of this tower.<sup>1</sup> As I remember it, it was about fifteen feet around to a ledge, or rather ridge, of the sort we were already on. It was an almost smooth surface, but with cracks here and there for fingers and toes. The guides said it was a good hold. I could not see it in that light. Imboden, however, did not wait to discuss the question, but advanced out on the face of the cliffs, and worked his way across and diagonally upward to the ridge, and called (from out of my sight) "Kommen Sie," — his invariable remark. Then I hesitated, and said to Knübel that as I had a wife down in the valley

<sup>1</sup> We have made bold, since brevity of time prevented our asking permission, to reproduce without leave the accompanying cut which represents this tower, as well as our spirited frontispiece, from the "*Zeitschrift des Deutschen und Oesterreichischen Alpenvereins*" for 1884, which was received when the present article was about to go to the printer. It is hoped that this evidence of appreciation will in some degree make amends for our lack of formality. The original of our phototype is a similar picture by J. B. Obernetter, of Vienna, which, in turn, is not from the original negative (by Signor Vittorio Sella, the celebrated high-alpine photographer), but from a print of this negative. Being then three removes from the original, we are gratified that our copy preserves so much of the spirit of Sella's masterly work. The view-point is more than 12,000 feet above the sea, upon the ridge ascended by Mr. Chapin. In the *Zeitschrift* these two views illustrate an interesting though brief article by Dr. Bruno Wagner, entitled "*Das Zinal-Rothhorn*." — Ed.



at Zermatt, perhaps I had best not go ; but he simply answered, " Wir haben Sie ganz fest, ganz fest ; " so I essayed to cross. I took but one look down between my toes as I was passing, — that was enough ; then I dug my fingers into the rocks, and did not indulge in farther sight-seeing for a minute. Knübel followed all right, and after a short climb we were on the summit, at 8.30 A.M.



The day was perfect, — not a cloud in the sky ; everything clear except the Italian valley of Tournanche between the Matterhorn and Breithorn, which was filled with billowy haze. The gigantic peaks of the Zermatt region were around me, — the long sweep of the Gorner glacier, with its

tributary ice-streams; the snowy Breithorn, which I knew so well; the matchless pyramid of the Matterhorn; the perfect symmetry of the Weisshorn, backed by the three masses of the Mischabelhörner; the minor and lesser peaks which flank Monte Rosa, and are but mighty buttresses against its enormous bulk. Near at hand were the glassy sides of the Dent Blanche, seemingly one sheet of cruelly steep glare ice. Little did we dream of the sad fate which in a few days would dash three climbers from its perilous steeps! To the east were the ranges of the St. Gotthard and Splügen, and I could see far beyond into the Tyrol. In the Bernese Oberland were domes and spires in line: Monte Viso was visible, and peaks in the Maritime Alps, a hundred miles away; and in the west, Mont Blanc rose like the great dome of a cathedral, with its sharp aiguilles and lesser summits, its awful precipices on the south, and sharp snow-lines against the sky to the north, — fifty miles from us, but as if seen across a narrow ridge, so dwarfed was the St. Bernard between us; and to look down there was a glimpse of the valley of Zinal, eight thousand feet below, and on the east a bit of the pastures of Randa; but the whole an endless vista of snow, ice, rock, débris, and desolation.

The thought of the descent marred a little the exultation in the view and over our success. We remained about twenty minutes on the summit. The air was still and balmy. It would have been agreeable to have rested at this point longer; but Imboden hurried me, as we must get off from the rocks and arête before the warm sun had loosened the stones and softened the snow. We clambered down from our tower, and I made the circuit of the second easily; but for two hours I was dangling on those oval rocks. It seemed impossible to find any place for my toes, and I had continually to call Knübel up to place them. The manner of our descent was this: Knübel would go down the length of the rope, about twenty feet, then I would follow; Imboden would keep the rope tight, just letting it out as I made progress. The rocks on this mountain lie the wrong way, and like shingles, overlapping, and almost always rounding off, so that I could not see where I was going, but could

only look off into space, the nearest apparent foothold being a mountain-top five miles away. Imboden held me firmly; but how he could do it, I do not see. In many places he had only two fingers in a crack, and his feet planted on inclined surfaces without a crevice, — only such hold as his hobnailed boots would take on rocks not quite polished; and he would say, "Go on, I have you fast," and then I would let myself down again; but he would never move when I was descending, and as the rope was kept tight, I never could bring any sudden strain upon it. There was no danger from my slipping, but what if Imboden should fall! Once, in a very trying place, after I had got down to Knübel, and Imboden was slowly feeling his way after me, I said to Knübel, "We ought to be braced against the rocks here, so that if Imboden should fall we could hold him;" but he only answered, "Imboden fällt nicht." These rocks of the Rothhorn are good specimens of difficult rock-climbing. There are other peaks harder. The Dent Blanche and the Matterhorn are more dangerous, and the Weisshorn is more tiresome; but I do not think steeper rocks could be climbed.

While resting on one of the ledges of the Rothhorn, I questioned Imboden about some of the other peaks, of their dangers and comparative difficulties, and especially of the Dent du Géant at Chamonix, which had never been climbed. He stated emphatically that it could never be conquered, as some of its cliffs overhang in such a manner that man without wings cannot surmount them. He had tried many times; and the previous year had slept at the base of this fine peak for three nights, in good weather, and had been unable to find a way to the summit. The same season the mountain was vanquished, but in a manner which did not lessen my opinion of Imboden's abilities. Three Italian guides worked with blasting-powder and sledge-hammers for four days at the mountain, and after driving in numerous iron stanchions and fixing ropes to them, managed, on the fifth day, to take up a member of the Italian Alpine Club to one of the summits. Mr. Graham of the English Club soon after climbed to the top of the upper tooth. This same

Graham, now so well known to the reading public, afterward took Imboden to Asia, and with him made some of those high ascents in the Himalayas.

Well, we finally got to the snow arête, and I thought the work was over; but the sun had melted the snow so much that to traverse it was very difficult. I now had my axe again, and had to dig that in on one side of the arête, and my hands in on the other. We could not stop anywhere to rest, for the footing was precarious; we were continually starting little avalanches, which would whir away down the slopes, joined by every loose rock in their paths. We were off the rocks before the stones began to fall much, but occasionally we would hear them rattling down the couloirs. It took over two hours to get down that arête, and then the glacier was so soft that it seemed forever before we reached the moraine; we sank in waist deep at every step. We then in a manner stumbled down towards our ledge, and there I lay down on a blanket and went to sleep. Imboden waked me in half an hour, and we reached Zermatt at 4.30 P. M.

---

## From the Sources of the Connecticut to the Rangeley Lakes.

BY ROSEWELL B. LAWRENCE.

Read March 20, 1885.

EARLY in July last summer, three members of the Club planned a camping trip to follow the July field-meeting at Newport, Vt. Accordingly, after ascending Jay Peak and Owl's Head, and enjoying the varied beauties of Memphremagog and Willoughby, two of us broke away from the happy party which was intending to pass Sunday at the Willoughby Lake Hotel. We hoped to meet our other companion at Wells River Junction. Unfortunately, however, our train could not connect with his; and, obedient to instructions, he continued on his course as far as North Strat-

ford, now and then alighting at some station to inquire about the trains from Vermont. At three different stations we were accosted by men who said they "guessed they had seen a friend of ours, — a young fellow, who was dressed like us, and who went up on the other train;" the "knickerbockers" thus enabling us to keep track of him. On reaching Lancaster, our train stopped to spend Sunday. Did we stop? Yes, long enough to eat supper and have a team hitched up. At about seven o'clock we drove out of Mr. Hunking's barn in a double-seated open carriage, with a pair of good horses, and Mr. Hunking for a driver. It rained hard; but we did not care, as we had a good supply of rubber coats and blankets, not to mention a large umbrella. The latter useful article did not belong to our camping equipments. It grew dark very fast, so that we were unable to enjoy the Pilot Range, Cape Horn, and the Percy Peaks. After a ten-mile drive in the pouring rain, we arrived at the Grand Trunk station at Groveton, where it was necessary to wait two hours and a half. For a time we amused ourselves weighing our packs and laying plans for our trip; and after that I studied maps, time-tables, guide-books, etc., while my companion enjoyed a nap, with a wooden bench for a couch and his pack for a pillow. About ten o'clock the train came along, and in half an hour we were welcomed at North Stratford by our companion.

After a good night's rest, we awoke to find the sun shining brightly, and soon arranged with a man to drive us to the Connecticut Lake Hotel. It speaks well for the roads of the upper Connecticut Valley to say that they were in good condition in spite of the heavy rains. The drive was exhilarating, the air being clear and cool and the sun bright and warm. We enjoyed exceedingly the beautiful scenery of hill and valley, — the distant view of the Dixville mountains and the near view of the Vermont Monadnock being especially interesting. During the day we saw many showers, but succeeded in running away from the heaviest ones. We started from North Stratford at nine o'clock in the morning, and our driver promised to reach the first lake by four in the afternoon. He kept his word, notwithstanding a long

stop at Canaan for dinner ; and at seven minutes before four we had finished the last of the thirty-eight miles.

The Connecticut Lake Hotel is situated near the dam at the foot of the first lake. This lake is four miles in length, two and three-fourths in its greatest breadth, and is situated 1,619 feet above the sea. Although it is visited by a few tourists in July and August, and by fishermen in June and September, it is supported chiefly by the lumbermen in winter, as is proved by the little holes in the planking of the piazza, made by the corks which the drivers wear on their boots. The hotel is comfortable, and will accommodate about fifty guests. Before supper we strolled to the top of the hill just beyond the house, and enjoyed a beautiful view of the lake, with the mountains beyond,—Magalloway on the right and the Camel's Rump on the left. The latter we intended to climb, and therefore observed it with special interest. It lay about northeast, and distant fifteen miles. It was a long mountain, with a slight sag near the middle, and a steep slope on the southern end. The moment I saw the mountain, I longed to climb the southern slope; and the longing still continues.

The next morning the clouds were very heavy ; but as the wind was still northwest, we concluded to run the risk of bad weather, and at seven o'clock shouldered our packs and started. After a short walk we stopped for breakfast. Kindling a fire with wet wood takes considerable time, as does also scouring burnt dippers. Suffice it to say that our stop was two hours long. Resuming our tramp, we reached the foot of the second Connecticut Lake at noon, and there found a log building partly filled with baled hay, and evidently used by the loggers in winter. The door was padlocked and the windows boarded. In front of the building was a large mass of chips, very convenient for building a fire. Concluding, therefore, to dine here, we unshouldered our packs and went to work. It had sprinkled a number of times during the morning ; and now several smart showers passed over, considerably impeding our culinary operations. We had plenty of time, however, and so did not worry.

One of my companions made a vain search for the path which, according to Farrar's map, crossed the stream at the dam, and followed the southern shore of the lake. He concluded that although it may have been there once, it was not there now. As the day passed, the showers became heavier and more frequent; and we finally concluded to pry the boards off one of the windows of the log building and take possession, thus denying ourselves the pleasure of building a camp in the rain. A bed of hay was prepared, and everything made comfortable. We retired soon after supper, and slept soundly from eight o'clock till four, except when it was necessary to "shoo" away the numerous mice or squirrels which seemed to be running around everywhere, and especially where my provisions were. We were also disturbed once or twice by unusually heavy thunder-showers, — not particularly by the thunder and lightning, but by the water which dripped from the roof.

It was very cloudy in the morning, but the wind was still northwest, — promising, as we thought, good weather. We took a bath in the lake before breakfast, the temperature of the air being 50° and that of the water 64°. Shortly before eight o'clock we shouldered our packs, and started upon a path which promised to follow the west side of the lake; and in less than an hour we arrived at "Chester's Camp." Mr. Chester and the three guests who happened to be stopping with him received us cordially, and gave us valuable information. Tacked upon the wall was a copy of the map drawn by Mr. Charles L. Adams, of Boston. It is quite reliable, and so far as the region along the Magalloway River is concerned, much more correct than any other that I know of. Little topographical work has been done in northern Maine and New Hampshire, and the maps therefore are largely the result of guesswork. Mr. Adams places Chester's Camp at the northwest corner of the lake, and Captain Farrar puts it at the southwest corner. The actual position is about the middle of the western side.

At the camp was an old man named Harding, who calls himself a guide. He has a camp at Rump Pond, near the Magalloway, and has connected it with the east shore of the

second lake by a "spotted" line. As this would take us past the southern slope of the Camel's Rump, we decided to follow it. Not even Harding had been over the trail for a year,—not since the terrible storm in December, 1883, which played such havoc in the forests of Maine and New Hampshire. Although the trail is a very bad one, especially at the two ends, Mr. Chester advised us to follow it, saying that Harding could set us across the lake in a boat and start us right, and that if we at any time lost the way we should be safe in following a compass-course a little east of north. Soon our traps and ourselves were packed into the boat, and we bade adieu to our new friends, except Harding, who was to start us on our way.

The second Connecticut Lake is two and three-fourths miles long, and from one-half to one mile wide, and is 1,882 feet above the sea-level. It lies buried in a wilderness. No mountains rise abruptly from its symmetrical shores; but over the forests which clothe its sloping hills mountain-summits can be seen, giving variety to the view. Were it not for Chester's Camp,—the only sign of civilization,—I should call the place a paradise for loons; in fact, I think it lonesome enough even without the loons.

The northwest wind helped us in crossing the lake, and in a short time we were searching for a landing. The heavy rains had raised the level of the lake, and we were obliged to flounder about in a swamp for several minutes before we could gain *terra firma*. Harding pointed out his blazes; told us, on reaching Rump Pond, to make ourselves comfortable in his bark shelter,—the camp itself being locked,—and then turned back into the swamp on the way to his boat. I thought to myself, "We shall camp on the slope of the Camel's Rump, and not in his shelter at Rump Pond."

We started all right. I wish now that I had kept an account of the number of times we lost that trail and found it again. We followed it all day, up hill and down, across brooks and through fallen timber. Once we caught a glimpse of a fine bit of scenery,—the southern slope of the Rump. It was only a glimpse through the trees, and the mountain must have been distant three miles. We had several show-



ers during the day,—one at 12.45, just as we stopped for dinner. I think the fire for that meal kindled more reluctantly than any fire I ever saw. The lunch consumed an hour and three quarters. According to Harding, his trail is ten miles long; according to Mr. Adams's map, it ought to be about nine. In my opinion it was crooked enough to measure fifteen. Late in the afternoon we consulted whether we should camp or push on to the bark shelter at Rump Pond; and, feeling confident that the pond could not be far away, we rashly decided to go on. At 7.15 we lost the trail in an immense tract of fallen timber, and there was not daylight enough to find it again; so we did the other thing,—we camped. The elevation was about 2,000 feet. Fortunately, the rain had stopped. Soon a good fire was burning, the oatmeal boiling, and trees were falling for firewood. By the light of the blazing fire you might have seen such sights as one of our number high up on the trunk of an old birch, tearing off great sheets of bark, or yonder emerging from the inky darkness, a mass of fir-boughs on their way to bed.

The next morning we had an early breakfast, and started at 6.30. We saw no trail, no mountains, no ponds,—nothing but trees, with clouds above and the earth below. With considerable difficulty we succeeded in penetrating the mass of fallen timber which had impeded us the night before, and after some tramping struck a logging-road, which quickly brought us to Rump Pond and Harding's Camp. But where was the Camel's Rump? I judge it was about two miles west of us.

Rump Pond is about 1,800 feet above the sea, and lies close by the Magalloway River, five miles north of Parmachenee Lake. The distance by the river is probably not over eight miles, but it is called twelve. The pond is elliptical in shape, the shorter diameter being about a third of a mile, and the longer one perhaps two-thirds. It has been noted for its trout-fishing, and was once a very wild and lonely spot. It is even now well surrounded with trees, but above it the logging operations have been quite extensive.

A few rods from the water, on the northwest side, is

Harding's cabin, — a wee bit of a log hut, with its door securely padlocked. In front was a birch-bark veranda, leading to a birch-bark shelter, in which were a few barrels and boxes. This was the hospitable shelter that had been offered to us. We had several light showers during our morning walk ; and on reaching the camp at nine, we were glad to stack our packs, canteens, hatchets, etc., and sit down upon something dry, while we held a council of war. The clouds, however, were more warlike than we, and soon convinced us that the Camel's Rump would not be seen, much less climbed, on that day. As no one was yet disposed to abandon wholly the idea of conquering the grand old mountain, we decided to accept Harding's invitation, and camp under his bark shelter. We made the roof and sides water-tight, cleared out the boxes, and cut boughs enough for a luxurious bed. A good fire was kept burning ; and over this was stretched a clothes-line, upon which we hung an extensive array of articles after each shower had passed over. The sun came out a few times ; but as the rain disregarded his presence, we were unable to accept his assistance in our clothes-drying operations. One of my companions says that he counted sixty-three showers during the day. The temperature was 47° in the morning and 56° at 5 P. M., and the wind was still northwest.

We were very busy, so that the time passed rapidly. Notes were jotted down in diaries, stockings darned, sketches drawn, and meals cooked. Our bill of fare shows that we lived plainly, and wasted little time in cooking. We had several kinds of canned meats, hot oatmeal and chocolate, pilot-bread, graham, and other varieties of crackers, and dates and figs for dessert. Dinner was like breakfast, and supper resembled dinner. During our whole trip we saw no game, — partly, perhaps, because we did not try to find it, and partly because it was not the right season. Two of us intended to do some fishing ; but lack of time and the swollen condition of the streams compelled us to give it up.

In spite of a few drawbacks, we enjoyed the day. The lonely pond, the dripping forest, the cloud-covered mountains, were all refreshing to us, so unlike were they to the city.

Ever and anon the note of "Wilson's thrush" was heard; and the sound was companionable, perhaps on account of the loneliness of the place. Even now in my imagination the whistle carries me back to the heart of the wilderness, and makes me feel that the wished-for mountain is near, even though hidden by the clouds. We retired at 8.30. During the night we had several heavy thunder-showers; and once my companions got up to replenish the fire, protect the supplies from certain animals which were heard but not seen, and — what I thought was their chief object — to regale themselves with cold oatmeal.

So far in my account I have neglected one subject,—not on account of its unimportance, but because it is trite. Things sometimes, however, are so very bad that they cannot be silently passed over. In short, there were at Rump Pond insects called midges, and others called mosquitoes. Our faces were soon a copper color, and the air was redolent with pennyroyal and tar. Whether the so-called preventives succeeded in preventing, I have not been able to decide. I have lately obtained a new ointment,—a mixture of pennyroyal, ammonia, olive-oil, and tar. The more tar the better, as it prevents the pennyroyal from evaporating, and produces a thick coating, which the insects find it difficult to penetrate.

The next morning the clouds hung low, obscuring even the foothills; and the prospect of suitable weather for climbing the Rump was so dismal that without any discussion we decided to start for Parmachenee Lake. One of our number desired to be at Boston on a certain day; and we all wished to get nearer to civilization, so that we might calculate the time necessary to reach home. Quietly resolving to return some day, I shouldered my pack and followed my comrades. Ignorant of the lumbering-camp on the east side of the Magalloway and of the tote-road connecting the camp with Parmachenee, we decided to follow the west bank,—a wise decision, perhaps, on account of the swollen condition of the river. All day we tramped,—now along the top of the high bank or at its base, close by the rushing stream; now balancing ourselves over a tributary on a slippery and unsteady

log ; now skirting or penetrating immense masses of fallen timber ; now floundering in a thick alder-swamp, and trying to find a way out by a compass-course ; now following a logging-road through its circuit of 360°, more or less ; now stopping to lunch, and immediately changing our minds on account of midges and mosquitoes.

As we wished to reach the lake where the Connecticut "carry" begins, we followed a compass-course during the afternoon, leaving the river on our left, and in this way went by Little Boy's Falls without seeing them, though I think we heard them in the distance. Soon we found ourselves ascending rapidly, — which was discouraging, as we knew a corresponding descent would be necessary. We climbed on, however, until suddenly we gained the summit of the ridge at a point where rocky cliffs enabled us to look out through the trees. A beautiful view was spread before us. In the foreground, two hundred feet below, was Parmachenee, the gem of the Magalloway wilderness. On either hand were hills covered with forests down to the shore of the lake ; while in the distance were several mountains, two of which were particularly conspicuous, and immediately arrested our attention, — on the left Deer Mountain, rising in a perfect cone at a distance of about fifteen miles, and on the right the double-topped Aziscohos, more than twenty miles away.

Our enjoyment of this charming picture was not unalloyed. The packs were no sooner slipped from our shoulders and the note-books and field-glasses produced than the air was filled with clouds of black-flies and other insects, so that it was almost impossible to see. With spasmodic strokes of the pencil and many frantic gestures, a sketch was quickly produced, and, picking up our packs again, we were fairly on the wing for the shore.

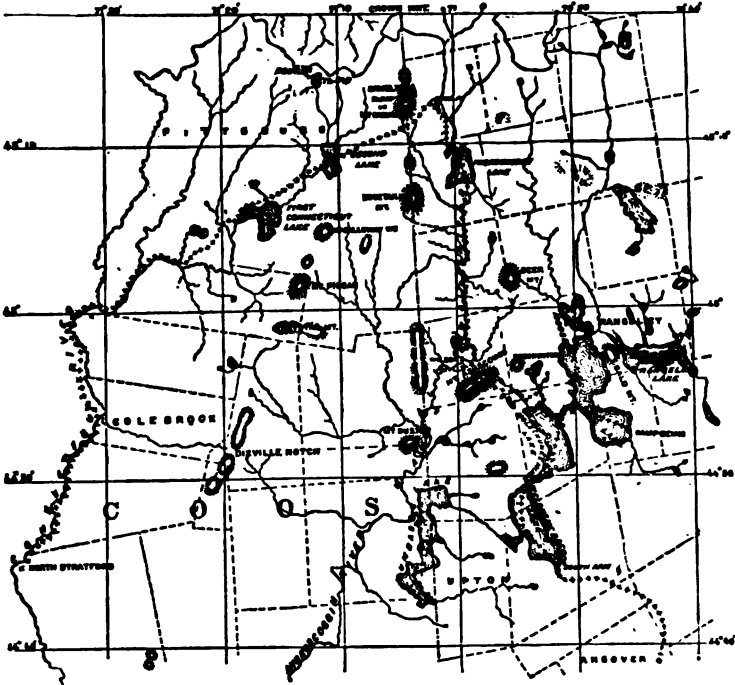
We reached the lake at a point between the river and the carry. By firing three times three shots as a signal, we brought a boat to us ; and in a short time we were enjoying the hospitality of "Camp Caribou," the sporting headquarters of the Parmachenee Lake region. It is situated on an island in the upper part of the lake. The proprietor and host is John Danforth, an intelligent and enterprising man,

who is endeavoring to provide for the sportsman and the lover of Nature all the facilities for enjoying this far-away wilderness. He has built several log-camps in various parts of the region, and furnished each with a camping-kit. He has excellent guides, who know the woods and streams, and are directed by him to consult carefully the wishes of his guests, and be ever ready to give information to strangers. He assured me he should take special pleasure in guiding a party of those who love to climb the mountains and explore the valleys.

The remote situation of Parmachenee is best appreciated when the Magalloway is measured from the lake to the point where it enters the Androscoggin, just below Umbagog, — a distance in a direct line of twenty-five miles, or sixty by the crooked river. The evening at the camp we spent in obtaining information from the guides, examining curiosities, and drying clothes.

Before leaving the region of the upper Magalloway, a few questions ought to be answered: What is the best map? Where is Rump Pond? Where is the Camel's Rump? If you look upon the State map, you will not find "Camel's Rump," but in its place "Mt. Carmel." In short, "Mt. Carmel" is the map name, and "Camel's Rump" the popular name. If you wish to use elegant designations to improve, as it is said, the nomenclature of the mountains, call it Carmel. But if you ever go to the Magalloway, I advise you not to ask the guides and trappers where Mt. Carmel is, for they do not know. Any one will point out the Camel's Rump. The draughtsman who made the map for Captain Farrar's "Guide to the Androscoggin Lake Region" was confused by these two names, and felt obliged to find two mountains to bestow them upon. Mr. Adams's map locates the mountain correctly, and calls it the Camel's Rump. Each of the maps has its own location for Rump Pond. In this matter Mr. Adams's map is the best, and the State map quite incorrect. There are no other maps besides the three just mentioned, except unpublished ones of various sections of the Androscoggin Lake region, drawn by surveyors for lumber operations. The sketch map which accompanies

this paper was taken mainly from the State map of New Hampshire, with more or less help from the other two, and from guides and personal observation.



The geography and physical features of this region cannot be thoroughly treated without giving a sketch of the boundary question. The investigation has proved interesting, and has brought to light much information concerning these mountains. In 1639 Sir Ferdinando Gorges obtained, by gift or purchase, what is now Maine. Captain John Mason was the owner of New Hampshire. In 1677 Massachusetts bought Maine. In the grant of 1639 the line between Maine and New Hampshire was ambiguously described, which gave rise to the bitter controversy which lasted so many years. In 1740 an attempt was made to locate the boundary, and the southern part was at that time completed. In 1789 the

work was continued and finished by the State of New Hampshire, without the co-operation of Massachusetts, of which Maine was then a part. On being admitted as a State in 1820, Maine became anxious to have her boundaries settled. Not only were her northern and eastern limits the subject of controversy, but also the western; the Atlantic Ocean being her only peaceful neighbor. Commissioners were appointed by Maine and New Hampshire, who perambulated the line, and made a report in 1828. Through the wilderness the line was blazed, and the distances given in rods. In this report is the earliest mention, so far as I know, of the name "Carmel," as applied to the mountain commonly known as the Camel's Rump. The Commissioners mention "Mt. Carmel, sometimes called Sunday Mountain." In 1839 Dr. Samuel L. Stevenson was sent by Dr. C. T. Jackson to explore the Magalloway region in behalf of the State of Maine. He camped on the north side of "Parmachena Lake," which he eulogizes highly. He continues: "We are now eight miles from the little lake situated at the base of the Camel's Rump Mountain. This lake is about three quarters of a mile in length, and about as wide." He undoubtedly meant Rump Pond. He went over the northeast side of the mountain in search of the boundary-line, and followed it till he reached the three stones which were supposed to mark the Canada frontier. He was convinced that this bound was not at the actual divide. He gave the distance from the Magalloway to the Connecticut as about ten miles. Wolves were reported as abundant.

On Aug. 9, 1842, the Webster-Ashburton Treaty was signed, settling the northeastern-boundary controversy. An iron monument was erected on the true divide between the St. Lawrence and the Atlantic, at the point where Maine, New Hampshire, and the Province of Quebec meet. This point is seventeen rods and seven links north of the old birch, which was the northern terminus according to the surveys of 1789 and 1828, and is seven miles north of "Mt. Carmel."

In 1844 appeared the final report of Dr. Jackson on the geology of New Hampshire; and in this we find an account by his assistants, Messrs. Whitney and Williams, of

their explorations in this region. They use the name "Carmel's Rump," and give the height as 3,615 feet. They describe the character of the mountain, the extensive view it commands, and their experience in camp on the summit.

In 1858 Colonel Henry O. Kent perambulated the boundary. The following extract is taken from his report to the New Hampshire Legislature: "Passing north on the night of September 20, we camped on the summit of Mt. Carmel, — an elevation of 3,711 feet, — sleeping on the bare rocks, and without water. The ensuing day we encountered a severe thunder-storm on the declivity of Mt. Abbott." This latter mountain has been renamed for Colonel Kent.

Professor J. H. Huntington perambulated the boundary in 1874 for the State of New Hampshire. He says that he took the name "Carmel" from the county map, which was one of the series issued by Professor Henry F. Walling between 1855 and 1860. Professor Walling does not recollect where he got the name, but it was probably from the Report of 1828. The first volume of the "New Hampshire Geological Survey," by Professor C. H. Hitchcock, 1878, contains several interesting and valuable articles written by Professor Huntington, who had charge of the work done for the Survey in the extreme northern part of the State. He gives a description of the mountain and the view it commands. The elevation given in his report is taken from Colonel Kent's.

After a night's rest in a bed at Camp Caribou, we started the next morning at 5.40 to row down the lake. To him who loves the wilderness, the view was one of surpassing beauty, both restful and refreshing. The lake is only three miles long. Several pretty islands dot its surface, and beautiful forests clothe the hills, which rise on all sides. The element of grandeur does not enter into the scene, there being no high mountains near the shore. Sufficient variety, however, is given by Bosebuck, a mountain two miles from the southwest corner of the lake. In a seemingly very short time we reached the outlet, and shouldered our packs for the carry, three miles long. Then for seven hours, including a short stop for dinner, we floated upon the Magalloway,



carried swiftly along by the swollen current. The water appears very black,—an effect due partly to the great depth of the river and partly to the nature of the bottom. The crooked stream carried us nearly around Parker Hill, and made Aziscohos change apparently from one point of the compass to another. The banks are low, and frequently give place to bogs and ponds.

At 2.25 we landed at the head of Aziscohos Falls, about forty miles below the lake as measured by the crooked river. Danforth set us upon the path which ascends Aziscohos Mountain, and then left us to go to the lower settlement. Our climb was quite easy, and from the cart-path to the summit took us one hour and forty-two minutes. My great disappointment at not being able to ascend the Camel's Rump was for a moment forgotten. There was spread before us one of the finest views of which New England can boast. Among the numerous sheets of water we easily identified the various lakes of the famous Rangeley chain, lying to the east and south, and almost at our feet; and along the valley below us on the west we here and there caught glimpses of the tortuous Magalloway. W. S. W., and half a mile from us, was the other summit of Aziscohos, a little lower than the one we were upon. Six miles S. W. was Mt. Dustan, 2,526 feet. Six miles S. by E was Moose Mountain, high enough to shut off the view of Welokenebacook. E. N. E., and only about two miles distant, was Observatory, with its rounded summit. On the west, just across the Magalloway, extended the long, low range of the Half-Moon Mountains; and beyond these was a wilderness of forest-covered summits, among which I thought I identified the so-called Crystal Mountains and Mt. Pisgah. North of the latter I picked out what I concluded was Magalloway Mountain,—the one we had seen from the Connecticut lakes. West of north and distant about fifteen miles was Bosebuck, near Parmachenee. The finest peak in our immediate neighborhood was Deer Mountain, situated N. E. by N. and distant from seven to eight miles. Its view must equal, if not surpass, that from Aziscohos; but it is much more difficult of access.

And now what can I say of the distant view? It was so

new and strange that I hardly dared guess the names of the innumerable peaks we saw. Yet, in order to stimulate the interest of those who are longing to visit Aziscohos, and to suggest a few ideas to those who have seen this summit from other points, I will try to give a description of what I saw. In the far north were several mountains beyond the Canada line. One of these was quite long, and had three tops,—probably Megantic. About E. N. E. was Mt. Bigelow, and  $15^{\circ}$  to the left a very distant mountain,—possibly Ktaadn, which is said to be visible; more probably it is a mountain near the Kennebec River. In the east were Abraham and Saddleback, while in front of these appeared Bald Mountain, lying between Moosetocmaguntic and Oquossoc Lakes. East of south was Bald Pate, and to the right of and beyond this were the mountains of the Grafton Notch. Ingalls, Baldcap, etc., probably came next, obscuring the Carter-Moriah Range. No mistake could possibly be made in identifying Mt. Washington. Its attendants, however, I could not satisfactorily distinguish. I could make out a mountain in front of and below Washington, which I suppose was Madison. To the right of Washington, on the sky-line, was a sharp peak, which was probably Adams. To the right of this appeared two other summits, both of about the same height apparently as Madison. To heighten the effect of this view of the Presidential Range—which, by the way, was distant about fifty miles—was Lake Umbagog in the foreground. To the right of the range were some mountains, considerably farther off, which were probably the Twins. In the west were the Dixville mountains, which are not very high; and to the right and far beyond were summits in Vermont,—probably Monadnock and the Willoughby Mountains.

But in all this beautiful and extensive view, what did I study the longest? Umbagog, Welokenebacook, Molechunkamunk, Moosetocmaguntic, Cupsuptic, or Oquossoc? Or was it Ktaadn or Washington? No, none of these. It was the Camel's Rump. The reason why it interested me I need not state. Suffice it to say that when viewed from the south, it is the east side which appears to be steep. The truth

is, that both the south and east sides are precipitous, — a fact which adds greatly to the interest of the Rump.

The name "Azischohos" has proved particularly interesting. The importance of the mountain, the fine view it commands, the apparent Indian origin of the name, the various spellings and pronunciations lavishly bestowed upon it, and, last but not least, the innate attractiveness of the word, spurred me on to an investigation. As a result of considerable correspondence with Indian authorities and historical societies, and of more or less search in libraries for books which either gave no information or could not be found, I may say that I have not yet decided how to spell, pronounce, or define it. I have, however, obtained some valuable advice from Professor J. H. Trumbull, who is doubtless our best authority on Indian names. To quote his words: "Indian etymology in any dialect is full of unknown quantities. . . . You could acquire a fair reading acquaintance with two or three modern languages before you could qualify yourself to guess, with one chance in ten in your favor, at the meaning of one half the Indian place-names between the Connecticut and Rangeley Lakes."

The maps, including those of New Hampshire by Walling and Cline, call the mountain "Azischohos." Dr. C. T. Jackson, in his "Third Report on the Geology of Maine," calls it "Aziscoos," omitting the *h*. His assistant, Dr. Samuel L. Stevenson, writes about "Esquahos Falls and Observatory Mountain, the highest mountain in the vicinity of the river." "Observatory" is the name now given to a round-topped summit which lies about two miles E. N. E. of Azischohos, and is considerably lower. Dr. Stevenson, however, must have meant Azischohos itself, as it is impossible to make a mistake in the mountain, which is the highest in the vicinity of the river. He applies the name only to the Falls. Mr. N. T. True, of Bethel, who is interested in Indian etymology, says: "We have *asiscu*, mud, clay; but I can do nothing with it." The Recording Secretary of the Maine Historical Society says it is not in the Maine vocabulary, but thinks it may be found in the Delaware dialect. "*As-sis-cu*, mud or clay; *as-sis-qua-hoos*, made of mud or clay." It is suggested

that perhaps the name was originally given by the Indians to a stream which had clay or mud banks ; that subsequently it was transferred to the neighboring Falls, and finally by the white man to the mountain itself. I have concluded, however, to leave the investigation to the professional Indian etymologists.

Besides the map name "Aziscohos," Dr. Jackson's "Aziscoos," and Dr. Stevenson's "Esquahos," — applied to the Falls, — we find in Theodore Winthrop's "Life in the Open Air" mention of "a wild mountain, Aziscohos, or, briefer, Esquihos;" and in the article by Joseph C. Abbott in Harper's (1860), "Escohos," which is the popular, as distinguished from the map, name. But the list does not stop here ; for we have Eskahos, Eziskahos, Aziskahos, Arziscohos, Escoos, and the degenerated pronunciation of some of the people, — Esquash.

We were remarkably fortunate in our view from Aziscohos. Neither haze nor clouds interfered with our sketching, except that a distant shower in the northeast required watching, in order that we might catch the whole of the horizon in that quarter. Anxious to complete my sketch, I remained on the summit till nearly sunset, while my companions kindly offered to look for good camping-ground. Water was found a short distance below the summit on the east side, just where the spruce-growth commenced. A rubber blanket, tied to a stake and three small spruces, served as a roof to shelter us from a possible shower ; while large boughs were piled on two sides to protect us from any wind which might find its way over the top of the mountain. The other two sides were left open, that we might enjoy the fire during the evening, and awake in the morning to behold again the lovely view of the Rangeley Lakes, of which Aziscohos can so justly boast. We gathered for our fire a large quantity of dead-wood, — remains of the forest which covered the mountain before it was burned over, forty or fifty years ago.

By this time it was almost dark, and I hurried to the summit to enjoy one more view. The valleys were filled with blackness, and clouds seemed to be forming all around me. The mountains in the west alone showed clearly. It was

eight o'clock, the wind was W.S.W., the temperature 58°, and the aneroid barometer registered 26.60. I presume the mountain is about 3,150 feet in altitude, — not very high, to be sure, and in fact only about 2,000 feet above the Rangeley Lakes. It is on account of its isolated position that it commands such an extensive view. Guided by the light of the fire, I found my way back to the camp over the broken ledges. A slight shower caused us a little uneasiness for a time; but while we were eating our oatmeal and crackers and drinking our chocolate, the clouds passed away, and the stars shone brightly forth.

We had a good night's rest, and awaked in the morning to enjoy that fascinating scene, — the mountains gradually appearing from the darkness, and the mists of the valley vanishing before the warm rays of the rising sun. We recognized Bald Mountain, floating like an island on the sea of vapor which covered Oquossoc and Moosetocmaguntic. Little by little the lakes appeared, till the whole panorama was again spread before us. The distant view, however, did not equal that of the afternoon before. At sunrise the temperature at the camp was 53°, and the water in the spring was 51°; at eight o'clock the temperature on the summit was 59°, the barometer stood at 26.57, with the sky clear, and a gentle breeze blowing from the south.

It was our plan to descend the mountain on the east side, and reach Mr. Whittier's camp at the northern end of Lake Molechunkamunk in season to connect with the afternoon boat, as Danforth had told us it was possible to do. We observed the lay of the land, and concluded to descend directly to Beaver Brook, and cross it at a point midway between two swamps. Alas, the swamps! We wished afterward that we had continued upon the ridge in the direction of Observatory, and then skirted the Richardson Ponds. We left the summit at 8.15, and descended very rapidly till we reached the mountain's base. The remaining adventures of the day I will pass over quickly, for they will not bear detailed description. We penetrated swamps and skirted bogs; we built a smudge to enable us to eat our lunch; we hunted some time for a place to cross the inky

waters of Beaver Brook, and had a very exciting time crossing on a wet log; we found that the lake had backed up into the forest, and, in order to save going back, we waded across one place where the water was about two feet deep; we had no sooner gained high ground than we were overtaken by a terrific and drenching thunder-shower. To cut the story short, we reached Birch Lodge at 6.30, and found it deserted. Fortunately for us, the kitchen door was unlocked. Mr. Whittier, the owner, is a member of our Club, and a friend of mine; for through my position as Recording Secretary I had made his acquaintance in Boston. Under the circumstances, therefore, I felt at liberty to invite myself and friends into his kitchen. Soon a fire was made in the stove, supper prepared, and the clothes hung up to dry.

The next day Mr. Whitney, who sailed up from the other end of the lake on a fishing-trip to the Richardson Ponds, kindly took us to the upper dam. From this point one of our number started for Boston. Two of us had planned to ascend Bald Mountain. We took one of the steamers owned by Captain Fred. C. Barker, and went as far as his camp, which is located on the southeastern shore of Moosetocmaguntic. Camp Bemis can be recommended not only to hunters and fishermen, but also to those ladies who wish to enjoy camp-life in a log cabin without sacrificing the comforts of civilization. Visitors are enthusiastic in their praise of the camp and its owner. Discouraged by heavy clouds and rain, we abandoned the ascent of Bald Mountain, and the next day started for Boston, taking the steamers to the South Arm; then buckboard to Andover, and stage to the Grand Trunk Railroad at Bryant's Pond. Here we parted, one going home *via* Portland and the other *via* North Conway.

## A Winter Excursion to Tuckerman's Ravine.

BY SAMUEL H. SCUDDER.

Read May 12, 1885.

DURING the second week in March I visited Jackson to see whether one could reach the depths of Tuckerman's Ravine from that place, and return the same day. Unable to find companions at home, I had planned to make the excursion alone, driving to where the path enters the woods near the Crystal Cascade, and then footing it on snow-shoes. The result shows that had I gone alone, — though there would have been no difficulty in the woods, — I should never have reached the path.

One of the attachés of the Thorn Mountain House, where I stayed, Edward Revelleou, wishing to accompany me, I gladly accepted his proposal, and we were off at 6.15 A. M. of the 11th, the thermometer at 2° Fahr. above zero. Another Jackson man, hearing of the trip, also proposed to join, and was to furnish an additional horse, as the road was said to be very heavy; but a gusty-looking cloud over the Giant's Stairs alarmed him, and subdued his zeal a half-hour before we started. The morning before, an inch or two of the finest snow had fallen, after which the wind had been giving it no peace. Whole sections of the road were therefore found drifted in, so as nearly or quite to obliterate any sign of a track, beyond that of a single sleigh, which had preceded us by a few minutes only to Emery's, the last house before the forest. This was more than three miles from Jackson; and though the road up to this point presented no more serious difficulties, we were obliged to walk the horse a considerable part of the way.

This was merely aggravating, on account of the time consumed. What followed was a different matter. No sleigh, and no single team of any kind, had gone farther up the road during the whole winter. An occasional "tote team," carrying supplies to the mill half a mile beyond the Tuckerman's Ravine path, and other five-foot sledges had kept the

road "open" by the aid of empty ox-sleds, trailing a crust-breaking chain-loop. The result at the end of winter was two narrow ridges of packed snow five feet apart, on which the sled-runners and draught-beasts had travelled, while on either side, and between them, lay the virgin snow, into which man or horse would sink to the middle. Now, as ours was an ordinary three and a half foot sleigh, the only means of progression was to keep the horse on the inner edge of one of these ridges of packed snow, from which he was almost sure to slip every three or four steps. This would support the sleigh-runners on the inner margins of both ridges, unless the horse swerved an inch or two either way, when down a runner would sink, and bring us to a halt; then it was generally necessary to get out, lift the runner, start on a few rods to get matters level, and entering the sleigh again repeat the process. As the horse naturally strove to keep the middle of the ridge, the runner behind him less commonly fouled than the other, which was on the side occupied by the driver. Revelleon, therefore, sat with no robe over him, ready to spring out at a moment's notice, and became remarkably expert in doing it in the nick of time. Indeed, he was out of the sleigh more of the time than in it, striding beside it on the ridge his runner failed to reach, and guiding the horse as he walked or plunged forward. This was especially difficult when the drifting snow had obscured the track; here we were continually obliged to lift the sleigh, while the horse perhaps sat on his haunches astride the snow-ridge, his front feet still holding to it, and gazed back at us with a wild leer, looking from behind, with his sloping back, for all the world like a giraffe. Not infrequently we had to shovel or tread out a track in some deep drift, or I would walk up some long hill while the plucky horse and the equally plucky driver would struggle up as best they could, floundering about in most absurd fashion.

We had three miles of this before we met the only team we saw that day, — an empty ox-sled breaking out the road, — and still another mile before we reached the Ravine path, less than eight miles in all, in just four hours. We had counted on two and a half as sufficient. As it would take



nearly as long to return, our chance of getting to the end of the Ravine seemed doubtful. Here I left the sleigh, which Revelleon took half a mile farther to the mill, while I awaited him at the Crystal Cascade, taking a photograph and instrumental observations. The thermometer had risen to 6° Fahr.

Leaving the Cascade at 11.30 A. M., we crossed the bridge gingerly, as the snow was heaped as high as the hand-rail, forming a narrowing ridge of snow barely a foot wide at top. Just beneath lay an open pool of icy water, to welcome the man who dared to trip on his snow-shoe, catch its long heel in the rail, or otherwise lose his balance; and yet on this narrow ridge the stride must be long, and the toes turned in as if one were afflicted with a deformity. Walking under such conditions was "phenomenal." The Cascade itself was — well, where was it? Its place was usurped by a bank of pure snow, with a half-open pool at its foot, and a thin icy fringe at the lower edge of the snow-bank, as it lapped the open water; that was all. Apparently a skim of ice had projected from either bank, and united in the middle, and on this had grown a structure which almost looked as if it would need a cannon-ball to shatter it. What more surprised me was that the same was the case with the more compact rush of waters at Glen Ellis Falls, visited on our return, where even the fringe of ice was wanting, and the snow-covering almost concealed all sound of the water, still pouring an abundant volume into the pool below.

We soon climbed the steep hill beyond the Cascade, the steepest part of the ascent; and though the snow, which lay three feet deep, often concealed the blazes, we followed the path with little difficulty. The snow was very soft in the forest, and we sank fully six or eight inches at every step. Once in crossing the bed of a stream my right leg went in fully a foot above the knee, the snow-shoe perfectly flat; this, however, was probably from my forcing open the top of some cavity arched over between the rocks. There was no crust whatever, and this made walking more wearisome, with only two to "spell" each other in taking the lead. It was such warm work that we were obliged to take off our

overcoats, and I was too warm with only a leathern vest and cardigan in addition to in-door clothing; the greater part of the way we wore no gloves.

In the woods there was little wind that day, but there had been at previous times; and the whole aspect was different from what our Mt. Adams party saw last winter, and did not compare with it for beauty. The snow had everywhere been tampered with by the wind, though it was nowhere thrown into drifts. The wind had played around each tree, and left its stem protruding from a snow pot-hole; it had flung bits of bark and fibre about, as if the woodpeckers had been busy, so that though several inches of snow had fallen within thirty-six hours of our coming (the storm having been more severe than at Jackson), it was already more or less impure, and the older and harder snow was mixed with the latest. Strangest of all, beyond a solitary woodpecker or two, and the occasional cheery twitter of the snow-bunting or other small bird we heard but did not see, no sign of animal life was observed on the open snow. In the valley the neat trail of the fox, following in easy curves now this now that side of the road, was no uncommon sight, and at short intervals a rabbit had crossed our path or had leaped among the bushes at one side or the other; but from the moment we left the road for the woods we saw not a single track, — fox, rabbit, sable, fisher, mouse, squirrel, and partridge were equally absent, — rendering the walk far more monotonous than last year's. We reached the 1<sup>k</sup> sign-board at 11.55 A. M., 2<sup>k</sup> at 12.55 A. M., and the junction of the path with that from the Mt. Washington road, 2<sup>k</sup>.725, at 1.50 P. M.

Here the snow effects were changed and became somewhat remarkable. Much more snow was fallen, and in hollows it must have been ten or more feet deep. Probably there were nearly four feet on a level; for the larger part of the blazes were concealed, though the path was here generally traceable with ease by its lane-like course through the more closely set trees. Some storm from the northeast had brought in a damp snow which had plastered every tree-trunk without exception, on its exposed side, from base to summit, still further obliterating the "spotted" trees; it had likewise

covered with a continuous sheet every branch of fir and hemlock, rendering it web-fingered, and on this broad palm succeeding storms had laid their burden, until the wearied flexible arm could no longer stretch itself for more, and it had fallen by slow degrees to a nearly vertically drooping position, the snow now piling along the branch above the base of the hand. Each tree, on its northeast side, had thus become almost a pillar of snow, and the forest was far more open to sun and wind than it would otherwise have been. This we found to our discomfort; for this feature continued to Hermit Lake, and the biting wind caught us, overheated from our walk.

The sharp wind came, but with it a scene of magnificence; for as we reached Hermit Lake (at 2.25 P. M.) we began at last to get visions of glory. The great ravine lay open before us, every projecting rock seeming to be brought out in vivid relief against its pure white covering. The curves of its side were more graceful than ever, softened in their irregularities by the winter mantle. The upper half of the end-wall where fall the thousand summer streams looked forbidding enough, but was streaked and flecked with white wherever the snow could lodge; its lower limits faded off into the snow, which must extend some distance upward, as it can lie at an exceedingly steep angle. The crags on either hand were more noble and overhanging than ever, and where near enough to be seen distinctly were covered here and there with huge drapery of icicles, often discolored, often connected in great curtains twenty, thirty, forty, or more feet in length, and sometimes far more in breadth. Near Raymond's Cataract these were abundant, and they seemed to seek the most conspicuous positions to throw back the glistening of the sun; above them on the mountain slopes, from the unbroken fields of white, which were like the *névé* of the Swiss Alps, the wind whirled great clouds of snow hither and thither, and swept them over the precipices.

In such a place one could stay but a moment to drink in the view. An attempt was made at a photograph, and we hurried on to the Appalachian camp, a few steps off, which we entered by sliding gracefully in on our stomachs, at a

corner where the snow did not quite reach the roof, and found a secure shelter from the winds. Here a few rabbit-tracks were seen, half covered by the last snow. With benumbed fingers we ate a frugal lunch of frozen condiments, after a fast of nine hours, and took observations again (the thermometer still at 6° Fahr.), finding the height of the camp above the entrance of the path 571 metres, or 1,872 feet, and above the floor of Arden Cottage, at Jackson, 949 metres, or 3,112 feet.

At 3.03, shivering from head to foot, we started on the homeward track. It was plain that we had reached the utmost limit of our time, and that we should barely get over the worst of our sleigh journey before dark; so we wasted not a minute. The quick march we made, pleasantly interrupted by a tumble now and then, as we were too reckless or became too helpless in the steepest places, soon brought back our warmth. We had reckoned it possible that we might by good work get out in an hour, and the ten minutes occupied in the descent to the junction of the paths inspired us with good hope; but our muscles began to feel the unusual strain, and we were each obliged occasionally to stop and favor a cramped leg; still we accomplished it in two minutes less than the hour, and parted company for the moment, — I to foot it to Glen Ellis, in the hope of catching a photograph; Revelleon to get the horse and meet me at the roadside. The falls, as said before, were invisible, and the visit to them was, so far, a failure; but the going up and down the steep staircase on snow-shoes, with the possibility of an undesirable plunge over the bluff, was a pastime not to be despised. This done, I donned my overcoat for the first time since leaving the sleigh, and sat on a log to await my companion. The return journey was like the advance, excepting that the breaking-out team had helped matters half the way to the houses, the "tote team" had passed the whole road, and there was more descent than ascent. Yet we were obliged to walk every step of the way to Emery's, more than half the distance home. It was nearly 5.30 when we left the Glen Ellis Falls, and 8 when we reached a welcome supper at Jackson. The trip, therefore, included for me six hours and a half in (and out of) the sleigh, and seven hours on snow-shoes.

Any one attempting to enter Tuckerman's Ravine in winter and come out the same day should allow seven hours from the road to the Snow Arch and back, unless the snow should be crusted, which it is never likely to be in the woods. A public house is to be erected near the entrance, which will probably be occupied in the winter, and would form a better base of operations than Jackson. If attempted from the latter place, the visit should be made in March (to allow of longer days) with a two-horse team and a wide sled, and the start should be made by an hour before daybreak. It would probably take less time, but of course involve more fatigue, to drive only to Emery's, and go on foot the rest of the way. Either would well repay any one attempting it, for I do not believe a grander sight is to be seen in the White Mountains than Tuckerman's Ravine in winter.

---

### Humphrey's Ledge and Its View.

BY JOHN WORCESTER.

WHAT is called in North Conway the "Humphrey's Ledge ride" is the ride across the bridge towards the Ledges, then northward about six miles to another bridge across the Saco, and home on the east side. This ride is often reversed on account of the hard hills on the west side, especially a very sandy hill just before coming to the little white school-house; but in this order the views are not nearly so fine.

Going north, on the west side, soon after passing the Moat Mountain path, the road enters a pine wood, and is delightfully smooth and shady for about a mile. The wood becomes open as it approaches Humphrey's Ledge; and for a considerable distance the Ledge is directly in front, apparently receding and rising higher and higher as we approach. In the light of the early afternoon the forms of three large Gothic windows appear in the face of the Ledge; but they are not so distinct when the light falls differently. For quiet majesty and beauty of form and color, there is nothing, within



Appalachia, Vol. IV, No. 2.  
Plate IV.

VIEW NORTHWARD FROM HUMPHREY'S LEDGE.

FROM A PHOTOGRAPH BY T. E. M. WHITE.



easy reach from North Conway, better than the face of this Ledge. It is a delightful short drive, in the late afternoon, to the brow of the hill opposite the Ledge, and return.

The Ledge, which ends a northeasterly spur of the Moat Range, constitutes the northern arm of the so-called "Arm-chair;" and the point to which the new path has been constructed, is the top of the back of the chair. This is considerably higher than either arm, and commands a view which possesses some peculiar beauties. Northward we have the Mt. Washington group, as represented in the accompanying plate (Pl. IV.). Washington, Adams, Madison, the long double mass of the nearer Wildcat, and on the extreme right, half hidden, Carter Dome, appear successively against the sky; while Carter's Notch repeats with steeper slopes the not less beautiful curve between Adams and Madison. In the northeast, beyond the field of our picture, Bartlett and Kearsarge stand out from the plain, presenting perhaps more of massiveness than when seen from any other point. The Conway Intervale, with the Saco and the maple groves, lies between us and the slopes of the Green Hills, terminating in the sunny south with the cultivated hills in the township of Madison.

But the most interesting part of the view from Humphrey's Ledge is that which includes Moat Mountain, with its bold slope down into the valley of Runnell's Brook, its great "Red Ridge," and the broad plain which separates it from the Ledges. The Ledges themselves turn their rounded shoulders to us, and are far from impressive; for we are in the place of that great northern glacier, towards which all our hills hunch their backs, turning away their faces. But the northern limb of Moat we see perpendicularly to the lines of the glacial action. A bold, strong slope it has, rounded towards the northwest, but with many small cliffs towards the south and east, and showing, in the sunshine of late afternoon, the glacial furrowing as of a broom over a snow-drift. The same effect is seen, in proper lights, over the whole side of the mountain.

As seen from the Conway valley, Moat appears like a steep wall; and as seen from the high peaks to the north, it ap-



pears flattened and broad. But from this intermediate point, upon Humphrey's Ledge, both the height and the breadth are fairly appreciated; the mountain is dignified in its masses, and gentle in its slopes, and presents a variety of beauty which is hardly equalled by any other mountain in New Hampshire.

The remaining portion of the outlook, over the Upper Bartlett valley and towards the mountains west of the Notch, is not peculiarly fine, owing to the lack of a good foreground. The same things are seen to much better advantage from Bartlett Mountain. But enough has been mentioned to show that for an easy afternoon's walk the path up Humphrey's Ledge has unusual attractions.

---

### Altitudes in Massachusetts.

BY E. G. CHAMBERLAIN.

Read April 8, 1885.

#### I. *A Sketch of the Massachusetts Trigonometrical Survey Conducted by Simeon Borden, 1830-40, with Table of Heights.*

MASSACHUSETTS, ever in the front rank of progress, was the first and long the only State to make a correct survey of its territory. While even the U. S. Coast Survey was in its infancy, struggling for existence against the indifference of Congress, the Massachusetts Trigonometrical Survey was commenced. Though others were nominally at its head at first, Mr. Simeon Borden, who contrived the base apparatus and did most of the field-work, finally took full charge, and carried the scheme to a successful completion, gaining thereby "a world-wide reputation for constructive ingenuity and elaborate accuracy of execution." The work has often been referred to as the "Borden Triangulation." I am aware that a sketch of his labors could be better treated by many members of the Club, some of whom are at present engaged in

similar work of far greater magnitude. It is not to such scientific members, but rather to those less familiar with topographical work, that I shall address myself, in attempting a popular rather than a scientific sketch.

The Massachusetts Trigonometrical Survey was authorized by the Legislature in March, 1830, and the field-work was begun in 1831.<sup>1</sup> Robert Treat Paine was appointed, nominally, Chief Engineer, and he performed most of the astronomical work. Mr. James Stevens was appointed Topographical Engineer, and he engaged as his assistant Simeon Borden, who afterward succeeded him. Neither Mr. Stevens nor his successor received instructions from Mr. Paine, but reported directly to the Governor. Soon after, a Geological Survey was added and placed in charge of Professor Edward Hitchcock.

A twelve-inch theodolite constructed for the Coast Survey was borrowed. To this Mr. Borden added a telescope of forty-two inches focal length for horizontal angles. He also contrived and made the apparatus for measuring the base line, which had been laid out on the plain in Deerfield, Whately, and Hatfield, and whose course, cleared of obstructions, formed a perfectly straight avenue for several miles. This apparatus was fifty feet in length, and at that time was considered a marvel of ingenuity and workmanship. It was composed of two parallel rods, one of brass and one of steel. These were connected at the ends by crossbars, each of which carried a small plate of silver marked with a fine cross. The arrangement was such that under changes of temperature in the rods these crosses remained just fifty feet distant. The rods were supported by a framework within an eight-inch tinned tube to protect them from the direct rays of the sun. When in use, the apparatus was mounted on tripods provided with screws so as to move it slowly in any direction. Several microscopes for the readings were provided. These

<sup>1</sup> The Coast Survey seems to have been first proposed in 1807; but before anything had been accomplished the War of 1812 broke out. In 1817 field-work was entered upon; but the enterprise was soon abandoned by Congress, there being from the nature of the work no readily apparent results for the expense involved. The work was begun in earnest, though on a limited scale, in 1832.

were mounted on tripods with some delicate fixtures for adjustment.

The base line was marked at each end by a three-quarter-inch copper bolt set in a rock, the centre of the bolt being indicated by a cross. In measuring it, one of the microscopes of the apparatus was placed, by means of two transits at right angles, with its cross hairs directly over the centre of the bolt. The "measure" was placed in line, and the cross on one end brought under the microscope and made to coincide optically with the cross hairs. A second microscope was now placed precisely over the cross on the forward end, and then the measure was moved one length ahead. The apparatus being entirely novel, experience was gained only by practice; and several months were consumed in measuring the base. This was done twice with extreme care, and its length determined to be 39,009.73 feet, or about 7.4 miles. Mr. Borden modestly called his ingenious device the "Massachusetts Apparatus," as it was invented and first used in this State.

About eighty hill-tops in all parts of the State were selected as primary stations, and marked by copper bolts. Signals were placed with their centres precisely over the bolts, but so constructed as to be readily removed when the station was to be occupied by the theodolite. From one to twenty-five days were spent at each station. At each end of the base, angles to the neighboring stations were measured with the theodolite, and the distances to and between these stations were calculated. These distances were used as bases for new triangles, and so on, until a network of calculated lines covered the State. The accuracy of the work was proved by measuring one of these calculated lines near Pawtucket, far distant from the original base. In 1844 the Coast Survey reached this section, and measured a base line of about eleven miles along the Providence Railroad near Mansfield. They occupied many of the Borden stations. Distances as determined by the two Surveys differed but a few inches in lines of several miles.

Mr. Borden occupied about seventy secondary stations within his larger triangles and on or near the State boundary. He also determined the position of about three hundred and

twenty church-spires and thirty-three lighthouses. Some of this secondary work was done with a smaller theodolite, the distances being subject to an error of perhaps six feet. Thus the positions and distances of upward of five hundred prominent points were determined, a thing of which no other State could then boast, and which few can show even now. By astronomical observations he determined the direction of the true meridian at the State House in the eastern and at French's Hill in the western section of the State. Through the triangulation the true meridians and azimuths were obtained for other stations.

In 1838 the general triangulation was completed; but an unexpected difficulty was encountered, necessitating additional work. In 1831, each town had been required to make a survey of its territory, and furnish a map thereof to the State Secretary on a scale of one hundred rods to the inch. Copies of these maps were made and cut out to shape. A skeleton map was prepared showing the precise position of all the determined points with pins stuck through them. When the town maps were transferred to it, with these known points pinned to their proper places, they should have fitted together like the pieces of a child's dissected map; but so incorrect was much of the town work that often boundaries did not coincide, and corresponding points of roads and streams did not meet. Small discrepancies were averaged, but many errors were too great to be passed over. Most of the town maps were too small, one town being half a mile short! Mr. Borden was therefore obliged to take the field again, with several assistants, and correct the more important errors. In reducing the distorted town maps to a proper shape for use, he used the camera-lucida, thus introducing an instrument since found of great value by the Coast Survey. The previously accepted position of many points was found to be greatly in error, one important lighthouse being placed three miles out of the way. Most State maps have been made up of such "patchwork" without a general triangulation, and consequently are often somewhat distorted; but Massachusetts, with five hundred fixed stations, had checks in every town. The projection of the map was completed in

1842. It was engraved on copper plates on a scale of 2½ miles to the inch, was published in 1844, and was revised and published in atlas form by Walling and Gray in 1871. Mr. Borden's work is being utilized by the survey now being carried on by the U. S. Geological Survey, with the aid of the State.

Mr. Stevens resigned in 1834, and Mr. Paine in 1838. Mr. Paine had made observations for latitude at about twenty-five points, and had made many chronometer comparisons to ascertain the difference of longitude between these stations and the State House. Through the triangulation the latitude observations were brought to bear on the State House, for which an average result was thus obtained. Mr. Borden assumed it as  $42^{\circ} 21' 30''$  N. He afterward regretted that he had not used the average of all Mr. Paine's observations, which would make it  $1''.84$  less. The Coast Survey has since located the State House in Lat.  $42^{\circ} 21' 28''$ .

The problem of the longitude was then far more difficult than that of the latitude. As the longitude of any place is merely the difference between its local time and that of Greenwich, were it possible to observe some event at both places at the same instant the difference shown by the local clocks would give the longitude. By observations on eclipses, occultations, etc., Mr. Paine made the State House 4h. 44m. 16.6s. slow of Greenwich, or in Lon.  $71^{\circ} 04' 09''$  W. In addition to the above method, the Coast Survey afterward compared our time with that of Greenwich by means of a large number of chronometers transported across the ocean, and in their report for 1851 the State House is given as in Lon.  $71^{\circ} 03' 30''$  W. More recently the ocean cables have enabled the Coast Survey to exchange electric time signals with European observatories. As a result the State House is now assumed to be in Lon.  $71^{\circ} 03' 50''$  W. This simple method of finding the difference of longitude by the electric telegraph is distinctively the "American Method," it having been first used by our Coast Survey between different sections of this country.

The position of the State House being assumed, the latitudes and longitudes of the other stations were calculated

through the triangulation. These, together with the bearings, distances, etc., were published by the State in 1846. On comparing the lists of stations as published by the two Surveys, it will be found that the longitudes differ, even if the tables be corrected for the differently assumed longitude of the State House. The explanation is that Mr. Paine's observations led him to assume a minute of longitude at the latitude of the State House to be about 4,501.5 feet, while the Coast Survey has assumed it to be about 4,504.0 feet. But for this the agreement would be very close.

Now as to the altitudes determined by the State Survey, — a subject of especial interest in view of a recent publication and comment upon the same in the last number of APPALACHIA. I refer to Bulletin No. 5 of the U. S. Geological Survey, entitled "A Dictionary of Altitudes in the United States, compiled by Henry Gannett." In noticing this work in the last issue of our Club publication, the editor remarks: "The showing for Massachusetts may well excite surprise. Of 295 entries 266 are furnished by the railroads; of the meagre remainder only nine are the heights of hills or mountains, of which our Club is authority for about half. None of the hills about Boston — not even Blue Hill — are given!"

This is indeed a paltry showing for our State. But we here shall see what Massachusetts had done in the way of correct measurement of her elevated points nearly fifty years ago. This was probably before any other mountain summits on the continent had been correctly measured, the barometer as then used being quite unreliable. The Borden list has been several times published, but not recently, which explains how it so unfortunately escaped Mr. Gannett's attention. In fact, for the State of New Hampshire he does not give one of the twenty altitudes ascertained trigonometrically by Professor Quimby in 1869, nor any hills whatever in Rhode Island, though our Massachusetts Survey measured several. Mr. Borden assumed as his base the mean between high tide and low tide. By direct levelling he found the height of five stations near the sea-shore. By vertical angles to and from these, other stations were measured, and so on till the altitudes of most of the primary stations were determined, the

meetings of the different lines checking each other. When Greylock, in the extreme northwest part of the State, was reached, its height was found to be 3,505.5 feet. By vertical angles from Mt. Helderberg, near Albany, depending on the spirit-levelling of the Hudson River Valley, the Coast Survey made Greylock 3,500.3 feet. The close agreement of the two triangulations meeting from opposite directions indicates the probable correctness of both. Other tests have proved equally satisfactory.

On examining Mr. Gannett's list, we find that of the few Massachusetts mountain altitudes given four are identical with Mr. Borden's, but neither he nor our State Survey gets any credit for them. These are Holyoke, Greylock, Wachusett, and Everett. Holyoke, 1,120 feet, is accredited to Dr. Toner. This is Borden's figure for Hilliard's Knob (Norwottock?), the highest point of the Holyoke Range. The summit usually visited and designated as Mt. Holyoke is four miles farther west and about 150 feet lower. The authority for Greylock is not stated. Wachusett and Everett (or Bald Peak) are accredited to Guyot. Four years after our State map was published Professor Guyot came to our country and made it his own. His great work among our Appalachian mountains is known to all. In a list of altitudes published in 1861, which, with the exception of one height in New York, his text intimates are all his own barometrical measurements, he gives but three for our State,—Greylock 3,505,<sup>1</sup> Bald Peak (Everett) 2,624, and Wachusett 2,018 feet,—the precise figures given by Borden. In a footnote Professor Guyot states that these three were "geodetic points in the triangulation of Massachusetts." He does not definitely say what he evidently intended, namely, that these figures were quoted from the Massachusetts Survey. So the eminent geographer has always had the credit for their determination. Next to these three, the Grand Monadnock in southern New

<sup>1</sup> The manuscript reduction of Guyot's observation at Greylock is now in the possession of Mr. J. Tatlock, Jr., of our Club. It makes Greylock 2,777.5 feet above his base in the observatory at Williamstown, which he assumes as 727.7 feet above sea level, making Greylock 3,505.2 feet in height. It now appears from the railroad levels that this base is but 708.4 feet, thus reducing Guyot's figure for Greylock to 3,485.9 feet.

Hampshire is perhaps the mountain best-known to the people of our State. In the list referred to, Guyot gives this as 3,718 feet, and is so credited in Mr. Gannett's book. But this same figure is given on Mitchell's map of 1843. Those familiar with the barometer will admit the impossibility of Guyot's obtaining precisely the same figures as were obtained by previous observers on four mountains, the only ones he gives in this vicinity; especially when it is considered that the first three are correct, while that of Monadnock is nearly 550 feet too high, as shown by direct levelling. I have been explicit as to dates because it has been suggested that Borden might have copied from Guyot.

For many years Professor Guyot devoted his summer vacations to enlarging our knowledge of the Appalachian system from New England to the far South. In his last years he was an honored member of our Club. It would ill become me to criticise his work. But pride in our State for the great work done at that early date, and justice to Mr. Borden, who executed it, demand that attention should be called to the fact that in the hurry of preparing his pamphlet, Professor Guyot unguardedly omitted to give proper credits.

The following list, carefully revised, with present names of hills and towns, contains most of the altitudes ascertained by the Massachusetts Trigonometrical Survey:—

## MASSACHUSETTS.

	FEET		FEET
Alden's Hill, Lakeville . . .	178	Daniel, Mt., Douglas . . .	785
Asnybunsket Hill, Paxton . .	1,407	Dug Hill, Blandford . . .	1,622
Ayer's Hill, Haverhill . . .	839	Esther, Mt., Whately . . .	995
Bald Hill, Douglas . . .	714	Everett, Mt. (Bald Peak), in	
Base, N. end, Deerfield . . .	220	Mt. Washington . . .	2,624
Base, S. end, Hatfield . . .	170	Fall River Hill, Fall River .	259
Bear Mountain, Wendell . .	1,281	Falmouth Hill, Falmouth . .	193
Becket Mountain, Becket . .	2,194	Fay's Mountain, Westboro' .	707
Blue Hill, Milton . . .	635	French's Hill, Peru . . .	2,239
Bourne's Hill, Sandwich . .	297	German's Hill, Yarmouth . .	138
Castle Hill, Saugus . . .	288	Grace, Mt., Warwick . . .	1,628
Chandler's Hill, Worcester .	748	Great Hill, Marion . . .	127
Coddon's Hill, Marblehead . .	118	Great Meadow Hill, Reho-	
Colonel's Mountain, Palmer .	1,172	both . . . . .	266
Copicut Hill, Fall River . .	355	Great Rock Hill, Rehoboth .	248



	FEET		FEET
Greylock Mountain, Adams . . . . .	3,505	Powow Hill, Salisbury . . . . .	328
Hatchet Hill, Conn. line, Southbridge . . . . .	1,016	Prospect Hill, Hingham . . . . .	243
Hawes' Hill, Barre . . . . .	1,285	Prospect Hill, Rowley . . . . .	264
Hazen, Mt., Clarksburg . . . . .	2,272	Prospect Hill, Waltham . . . . .	482
High Ridge, Williamsburg . . . . .	1,480	Provin's Mountain, Agawam . . . . .	665
Hilliard's Knob, Amherst and Granby . . . . .	1,120	Railcut Hill, Gloucester . . . . .	205
Hitchcock Mountain, Wales . . . . .	1,190	Rattlesnake Hill, Conn. Line, Wilbraham . . . . .	1,077
Holt's Hill, Andover . . . . .	423	Red Brush Hill, Wrentham . . . . .	456
Hyannis Hill, Barnstable . . . . .	81	Salisbury Marsh, rock on N. H. line, Salisbury . . . . .	6
Jackson's Hill, Blandford . . . . .	1,717	Scituate Hill, Cohasset . . . . .	180
Jilson's Hill, Vt. line, Rowe . . . . .	2,109	Seymour Mountain, Sandis- field . . . . .	1,698
Joe's Rock Hill, Wrentham . . . . .	486	Sprague's Hill, Bridgewater . . . . .	192
Lincoln, Mt., Pelham . . . . .	1,246	Spruce Hill, Hoosac Range, Adams . . . . .	2,588
Manomet Hill, Plymouth . . . . .	394	Telegraph Hill, Marshfield . . . . .	205
Mashamugget Hill, Charlton . . . . .	1,012	Tom, Mt., Northampton . . . . .	1,214
Mendal's Hill, Acushnet . . . . .	146	Tufts' Hill, New Braintree . . . . .	1,179
Monk's Hill, Kingston . . . . .	313	Wachusset Mountain, Prince- ton . . . . .	2,018
More's Hill, Goshen . . . . .	1,713	Wallum Pond Hill, Douglas . . . . .	778
Nahant Hill, Nahant . . . . .	90	Watatick Mountain, Ash- burnham . . . . .	1,847
Packard's Mountain, New Salem . . . . .	1,278	Winchell's Mountain, Gran- ville . . . . .	1,862
Peaked Mountain, Monson . . . . .	1,239		
Perry's Peak, Richmond . . . . .	2,089		
Pocumtuck Mountain, Char- lemont . . . . .	1,888		

## NEW YORK.

Berlin Mountain, Berlin, 2,814.

## RHODE ISLAND.

Bullock's Neck, East Provi- dence . . . . .	16	N. W. Corner of the State, Mass.-R. I.-Conn. bound. stone . . . . .	633
College Hill, Providence . . . . .	224	Pocasset Hill, Tiverton . . . . .	323
Mt. Hope, Bristol . . . . .	216	Quaker Hill, Portsmouth . . . . .	286
North Beaconpole Hill, Cum- berland . . . . .	517	Trial Base, south end, East Providence . . . . .	57

II. *Amateur Hypsometric Work in Eastern Massachusetts.*

It has been suggested that a description of some amateur work of my own might prove interesting. Though no great precision is claimed, it may be of value as part of our Club

work. As a schoolboy, like most of that class, I enjoyed an occasional ramble in the country, and in studying the route on the maps, was led to notice and sometimes to correct errors. The pleasure was enhanced if I could mount some eminence affording a distant view and an opportunity to use a small spy-glass and compass. Our geographies then knew of no highlands in New Hampshire except the White Mountains, Grand Monadnock, and Kearsarge,—the latter being unmistakably the original one of the name in Warner. All visible peaks were assumed to be one of these. I was early led to notice the different forms and the variety of directions in which these alleged White Mountains appeared. Subsequent study has shown that five different summits had been shown me for Monadnock, and perhaps as many for Kearsarge.<sup>1</sup> Some fifteen years ago I determined to identify these mysterious peaks, and for that purpose visited many of the Borden stations. With the instruments described below I roughly extended our State Survey over southern New Hampshire, triangulating the position and sometimes the height of the prominent summits. I have found our State Survey also convenient in studying highlands of Rhode Island and Vermont.

Before visiting a hill I compiled a list of the bearings, if any, observed therefrom by the State and Coast Surveys, and calculated those of other distant points I wished to look for; but if the hill was not a Survey station I determined its latitude and longitude by observing, at my first visit, on three

<sup>1</sup> On a recent visit to Bunker Hill Monument I was surprised to find still retained in the guide-book an error whose absurdity I pointed out to the attendant a dozen years ago. In describing the view from the *west* window it says: "At the right of Monadnock and to appearance near each other are Kearsarge and White Mountains." It does not say which is which; but no matter, they are neither. The summits referred to are the twin peaks of the Pack Monadnock, which, before the days of our Club, have done duty for nearly every mountain in New Hampshire and even for the Green Mountains of Vermont. Current statements regarding some of our mountain altitudes are as amusingly erroneous. The height of Wachusett, for instance, is variously stated, from 2,018, the correct height, up to 4,000 feet. One figure, 462 feet too high, is absurdly imputed to the Coast Survey. Hales' map of Boston and vicinity (1820) gives many altitudes, now sometimes quoted, which are undoubtedly barometrical. They are generally too high; some of them, as I have proved, being about 200 feet too great.

such stations. For calculating bearings and positions I copied on two pages of a pocket-diary a table of natural tangents to four figures for each degree. Another page was occupied by some simple tables I contrived, and a diagram giving the geodetic correction for each  $15^\circ$  of bearing at each ten miles of distance. No logarithms were used, and the results were reliable to 2' of azimuth. The tables answered for all the adjacent States. I have intentionally preserved such facts as I have found regarding our State topography, and the angles I have measured furnish skeleton view-guides to many of our lookout points. Such information as I have gathered is at the service of any of the Club who may care to make use of it. Success in this work strengthened my desire to correct the errors noticed in our local maps, and led me to attempt a humble imitation of the Borden Triangulation. The work was done as a Saturday afternoon recreation, principally between 1870 and 1876. Since the latter date want of time has mostly limited operations to the Blue Hill region.<sup>1</sup>

My apparatus, except a 100-foot tape and pocket spy-glass for reconnoitring purposes, was of my own construction. The azimuth instrument was a five-inch brass circle graduated (with a pair of dividers) to degrees. The alidade had a vertical thread-sight, a level, and a vernier. The instrument was mounted on two blocks, "parallel plates," with screws for levelling. It could be placed on a boulder or stump, or screwed to the top of a steel-pointed walking stick. For vertical measurements I contrived the following apparatus. An eighteen-inch ruler, separable into three parts for packing in the pocket, was provided with a level. Each end carried a brass sight, with a slot and horizontal thread a half-inch higher in one sight than in the other. Opposite each thread, in the other sight, was an eye-hole, these being of course at precisely the same distances above or below the threads. To the level was glued a paper scale, so graduated by trials that the bubble itself indicated the tangent of inclination on a radius of 500. An observation was made, and then a second, with the instrument turned end for end. No matter how much the level was out of adjustment, the two

<sup>1</sup> See APPALACHIA, Vol. III. p. 122.

errors cancelled each other, and the sum of the two readings gave the height in thousandths of the distance, an easy ratio to solve. Practice developed various devices by which this simple instrument was rendered reliable to one or two feet in a mile. It was placed on a folding frame with three screws, which could be set on any convenient support. For approximate angles, for details, or for taking the courses while pacing out paths or streams, I used a pocket compass with notch and peg sight, so adjusted as to correct for the magnetic variation. The degrees being numbered in reverse from  $0^{\circ}$  to  $360^{\circ}$ , the north end of the needle pointed at once to the true azimuth. This whole kit of apparatus could be carried in the coat pockets.

Attention was first given to the Waltham and Weston hills. With the tape I measured, in Newton, a base line of 5,638 feet, from which were determined the positions of many points in Newton, Waltham, and Weston. At Prospect Hill I connected the work with the State Survey, thereby obtaining the true azimuths, latitudes, and longitudes. Some stations were determined by the three-point method, by observing on steeples located by the State Survey.

The altitudes were based on the profile of the Boston & Albany Railroad, and checked by Borden's height for Prospect, 482 feet, for which my own figure was three feet less. The Blue Hills and vicinity were referred to the track of the Boston & Providence Railroad, and checked by Blue Hill, 635 feet, on which I made about the same error. As further checks, I have since levelled with the pocket apparatus from mean tide in the Neponset River to the top of Milton Hill, and from Charles River to the base of Bunker Hill Monument, up which I counted and measured the courses of stone. As the heights of different points have been discussed, or interest in the subject has been otherwise awakened, I have gradually extended the work into many of the towns in Middlesex and Norfolk Counties. Within twenty miles of Boston about one hundred hills have thus been measured. I learn that other members have been at work in the same field, and I heartily second the plan suggested in the last APPALACHIA for a Club map of our suburban regions.

Below are given the altitudes, as I have determined them, of some points of interest near Boston. If unqualified, the probable error is less than five feet. When greater, the amount is indicated by the small figures.

	FEET		FEET
State House cupola windows,		Doublet Hill, W. summit,	
Boston . . . . .	229 <sup>6</sup>	Weston . . . . .	364
Bunker Hill Monument, at		Doublet Hill, E. summit,	
ground . . . . .	83	Weston . . . . .	360
Bunker Hill Monument, win-		Brown Hill, Weston . . .	360 <sup>10</sup>
dow-sills . . . . .	284	Bald Pate Hill, Newton .	312
Bunker Hill Monument, peak		Waban Hill, Newton . .	306
of roof . . . . .	304	Institution Hill, Newton .	295
Bare Hill, Stoneham . . .	320 <sup>15</sup>	Oak Hill, Newton . . .	292
Turkey Hill, Arlington . .	377 <sup>8</sup>	Chestnut Hill, Newton . .	285
Arlington Heights, Arlington	380	Sylvan Heights, Newton .	252
Wellington Hill, Belmont .	310 <sup>10</sup>	Nonantum Hill, Newton .	249
Meeting House Hill, Water-		Pomeroy Hill, Brighton Dist.	180 <sup>10</sup>
town . . . . .	233	Corey Hill, Brookline . .	270
Prospect Hill, Waltham .	482	Lyman's Hill, Brookline .	339 <sup>6</sup>
Little Prospect, Waltham .	434	Bellevue Hill, West Roxbury	
Bear Hill, Waltham . . .	360	Dist. . . . .	334 <sup>6</sup>
Reservoir Hill, Lincoln . .	395	Fairmount Hill, Hyde Park	258
Mt. Tabor, Lincoln . . .	390 <sup>10</sup>	Little Blue Hill,* Canton .	335
Annursnack Hill, Concord .	370 <sup>10</sup>	Great Blue Hill,* Milton .	635
Fairhaven Hill, Concord .	340 <sup>20</sup>	Hancock Hill,* Milton . .	507
Goodman Hill, Sudbury . .	415 <sup>15</sup>	Milton Hill, Milton . . .	141
Nobscot Hill, Framingham	602 <sup>10</sup>	Bugbee Hill,* Quincy . .	439
Reeves Hill, Wayland . . .	410 <sup>10</sup>	Bear Hill,* Quincy . . .	495
Brush Hill, Sherborn . . .	390 <sup>6</sup>	Glover's Hill,* Quincy . .	430
Pegan Hill, Natick . . . .	408 <sup>6</sup>	Chickataubut Hill,* Quincy	518
Snow's Hill, Dover . . . .	449 <sup>8</sup>	Wampatuck Hill,* Quincy	357
Moose Hill, Sharon . . . .	530 <sup>6</sup>	Rattlesnake Hill,* Quincy .	314
Maugus Hill, Wellesley . .	325	Penn's Hill, Braintree (?) .	207 <sup>10</sup>

I append some observations of my own in Rhode Island. Beaconpole Hill Coast Survey station I find by pocket-level to be thirty feet higher than the Borden station, or 547 feet, and distant nearly half a mile southwesterly. The true summit may be a few rods further west and perhaps three feet higher. Woonsocket Hill I have made about 560 feet, though the trees prevented satisfactory observations in either direction. A rough estimate without instruments made Diamond

\* Summits of Blue Hill Range.

Hill about 500 feet. An attempt to find the Three-State Boundary-stone, at the corner of Massachusetts, Rhode Island, and Connecticut, failed through want of time caused by a railroad accident. A resident of Thompson, Conn., told me the summit of the ridge was in Rhode Island, a few rods east of the stone and a few feet higher, or not far from 650 feet, and perhaps the highest point in that State.

---

### The Flora of Mt. Monadnock.

By WILLIAM H. STONE.

ON the sides of the mountain the dark conical spruces arise among the lighter deciduous trees, or by themselves impart to great patches their sombre hue. As the trees grow higher on the mountain, they decrease in size, until finally the forest disappears, leaving a wilderness of bare or lichen-covered rocks, with only scanty soil in the hollows and fissures. On this barren, wind-swept tract, extending a mile or two along the mountain-ridge, and elevated three thousand feet, more or less, above the sea, there is a flora that is at once seen to differ, either in the species which it comprises or in the peculiarities of its plants, from that of the surrounding country.

It is said that the top of Monadnock was formerly covered with a stunted forest growth, and that this was destroyed by fires that have run over the mountain. Nature has not been able to rehabilitate this sky-land. The extreme summit of the mountain is treeless, and there are no trees of any considerable height above the forest; but scattered over the tract under consideration are clumps of mountain-ash, and some spruces and paper birches. But the last two present a marked contrast to the beautiful trees of the same species in the lower forest. The spruces increase in size and number until they mingle with the forest below. Here they often take very peculiar forms. Instead of having the tapering, symmetrical shape which this species usually assumes,

they are dwarfed and often half dead except for a few feet above the base, but close to the rocks throw out a most luxuriant growth horizontally. A tree that grows about a mile from the principal summit, on the long ridge that runs to the northeast, may serve for an illustration. From its position, the upper part of the tree is exposed to the full force of the winds that sweep over the mountain. The height of the tree is only about eighteen feet; but, growing in a depression among the rocks, its lower branches are sheltered from the winds, and have made a very thrifty growth close to the ground, so as to form a dense carpet in the hollow, and measure thirty-six feet from tip to tip. Above these branches the tree has only a moderate diameter, and is partly dead. Another tree is only about three feet in height, but covers a circle nearly eight feet in diameter. The paper birch rises only a few feet, but throws out branches near the base, and forms a dense head. Before the leafing, were it not for the characteristic bark, one would be unlikely to recognize these misshapen and stunted trees as members of the graceful birch family.

Emerson well calls this mountain-peak

"That barren cone  
Above the floral zone,  
Where forests starve."

And yet, excepting some spots of reddish gravel apparently washed bare by the rains, such soil as has accumulated in the fissures and depressions among the rocks is densely covered quite to the summit with flowering plants, — and with plants, too, some of which bear most beautiful flowers. One climbing the mountain about the first of June might be surprised to find this mountain-top, that from below looks so bare and desolate, bright with such great masses of a beautiful purple flower as would be no discredit to the fairest garden. Very beautiful they are, growing among the wild gray crags. The plant is the rhodora, a low shrub, with rose-purple flowers resembling in form those of the purple azalea so common in swamps in some parts of New England. It is confined to mountains and swamps, and damp cold woods. It here

grows only a foot or two in height, and bears its flowers in little tufts, at the ends of the branches, just as the leaves are coming forth, and is afterward covered with purplish pods. It is very abundant, and may be found on the very summit of the mountain. While the rhodora is in blossom on the top of the mountain, the pretty white flowers of the common choke-berry cover large patches in the pastures below the mountain-house; and gradually the bloom climbs the sides of the mountain till it quite reaches the summit. This little shrub, which on the top of the mountain seldom attains the height of more than a foot, though growing from two to five feet high at lower elevations, is widely spread over the mountain.

But "Cheshire's haughty hill" seems to reserve some of its gayest bloom for those who climb to its summit on the anniversary of our national independence. *Potentilla tridentata* and *Kalmia angustifolia* are then in flower. The first, the three-toothed cinque-foil, may be recognized by any one by the two very conspicuous notches at the apex of each small and otherwise entire wedge-shaped leaflet. It is a humble little plant, rising here only an inch or two above the soil before flowering. It is to be found on the coast of New England, and on mountain-tops from the Alleghanies northward. Rooting, as it does, in cracks in the rocks into which it would be scarcely possible to thrust a knife-blade, it seems peculiarly fitted for bare mountain-tops and wild crags. One notes the fitness of things when he finds this little plant growing on the edge of that stupendous precipice standing at the head of the White Mountain Notch. Its star-like, snow-white flowers are borne on stems rising six inches or less. Blossoming everywhere on the top of the mountain, its flowers, infinite in number, are very noticeable against the dark rocks. The other plant is the sheep-laurel, so common in pastures and on hillsides. It is to be found from Hudson's Bay to Georgia. On the mountain its rose-red flowers form a striking contrast with the white blossoms of the cinque-foil. In the spring its leaves, which persist through the winter, have a soft brown color; and large masses of this plant are then very noticeable on the upper slopes of the



mountain, and quite pleasing in contrast with the dark gray rocks.

Neither the cinque-foil nor the laurel continues long in blossom ; and there is no more very conspicuous bloom on the upper parts of the mountain until autumn. Together with some grass, the four species that have been mentioned, — rhodora, choke-berry, cinque-foil, and laurel, — with dwarf blueberries and the cow-berry, constitute by far the greater part of the vegetation over the “bald” of the mountain. The cow-berry (*Vaccinium Vitis-Idæa*) is described by George B. Emerson in his “Trees and Shrubs of Massachusetts” as follows: “This plant, so far as I know, occurs in only one spot in Massachusetts, which is in a pasture in Danvers, where it was found by Mr. Oakes in 1820 or before. It has some resemblance to the cranberry ; but the leaves are larger, and the branches larger and shorter. It has a creeping, woody root, with ascending angular branches a foot or more long. The leaves are coriaceous and shining, like those of the box, but darker. The flowers are pale pink, four-cleft, and with eight stamens. The berries are blood-red, acid, and austere. In the north of Europe, where it abounds, it is used as the cranberry, but is inferior.” In New England it is confined almost exclusively to the higher mountains. On Monadnock it is seldom to be met with except in the vicinity of the summit, where it often forms dense carpets in the hollows among the rocks, and rises only two or three inches above the soil. Its leaves are evergreen, and for most of the season no other plant there is so likely to attract the attention.

Perhaps the most interesting plants on the mountain are the Greenland, or mountain, sandwort (*Arenaria Grælandica*), and the Labrador tea (*Ledum latifolium*). Both are to be found only sparingly. The first is a little tufted plant, with thread-like stems and leaves and pretty white flowers. It is an arctic plant ; Dr. Kane found it growing at Upernavik, five hundred miles beyond the Arctic Circle. It continues in blossom from spring or early summer until autumn. On the top of Mt. Washington, where it occurs in comparative abundance, it has been found in bloom on the 11th of March. It is there called by the hotel people the mountain

daisy. It grows on the summits of all the higher mountains of New England. The Labrador tea is a strange-looking plant. It is an evergreen shrub, and has the under, concave sides of the thick leaves, and the new shoots, densely covered with rust-colored wool. In the early summer it bears white flowers crowded in terminal clusters. In New England it is to be found only in cold bogs and on mountains, but grows in all the countries north of us. On Monadnock it is quite abundant in a little swamp southeast of the summit, where it rises eight or nine inches from deep beds of moss. In Labrador its leaves serve as a substitute for tea; and Thoreau's Indian guide in the Maine woods told him that the Indians there used it for the same purpose.

In the early autumn the golden-rods that then fill the land are represented on the mountain-top by numerous plants of the species *Virga aurea*, and perhaps of other species, usually only a few inches in height and with racemes quite large for the size of the plants. But at this season it is the berries that will be most remembered. The mountain is then a veritable "garden of berries," to quote once more from that poem which, as Thomas Starr King says, has made Monadnock the noblest mountain in literature. Perhaps the first to catch the eye on emerging from the forest may be the great clusters of berries, white, red, or blue, according to the degree of advancement, borne by the withe-rod (*Viburnum nudum*), a shrub having handsome cymes of white flowers in early summer; or the pretty red berries of *Nemopanthes Canadensis*, the "cheerful but modest mountain holly." Even without its berries, this low, much-branched shrub, with clean light-green leaves and ash-gray bark, is not likely to be unnoticed by him who observes the mountain flora. It is frequently to be found, and sometimes forms dense thickets. One will probably not need to look far to find the large glossy-black choke-berries, astringent in taste; and near the summit the fruit of the cow-berry, the mountain cranberry, glows red among the shining leaves. But most refreshing to the thirsty climber are the very large blueberries that grow plentifully among the rocks; and the relish with which they may be eaten will not come entirely from the condition of the feaster,

for there is a saying that the higher the bushes are the sweeter is the fruit, and Thoreau, I remember, says that the blueberries on Katahdin had the spicier flavor the higher they grew.

Beside the plants that have been mentioned, the red-berried elder and the small bush-honeysuckle — one flowering early in the season, the other throughout the summer — may occasionally be found; and the clintonia, with its two, three, or four oval leaves rising from the base, grows almost to the summit. A few willows may be seen; and, perhaps, rarely the high blackberry. But flowering plants other than those that have been mentioned will seldom be seen much above the forest. The common plantain, so abundant about dwellings, and the yarrow, so often seen in fields, though they are seldom if ever to be found elsewhere on the top of the mountain, grow in somewhat sheltered spots on the very summit. They are just where picnickers most strew their eggshells and chicken-bones; and one would judge that they had originated from seeds transported to the top of the mountain by visitors.

Monadnock is not of sufficient height to exhibit fully the transition from temperate to arctic regions. Yet, as one ascends along the path from the mountain-house, through the noble forest of yellow birches, and sees the trees gradually decrease in height and at length become dwarfs with spreading bushy heads, and finds the hardy spruces shrunk to low and stunted trees, and finally emerges on the bare crown of the mountain with only mosses and lichens and such vegetation as has been described, he may realize that one who ascends to one of our higher mountain summits has much the same opportunity for botanic study as he would have "if he made a journey to the north, passing first from the noble forests with which we are familiar, to those of stunted growth, and finally leaving them behind altogether, at length arriving at the barren and bleak regions beneath the Arctic Circle."

## Recollections of the West Humboldt Mountains.

BY W. WHITMAN BAILEY.

Read April 9, 1884.

THE following notes are from a diary kept by the writer while a member of the U. S. Geological Survey of the 40th Parallel under Mr. Clarence King. They have reference to the West Humboldt Mountains, one of the many chains which extend in a north and south direction through the Great Basin.

Sept. 3, 1867. — Mr. King thought it wise, owing to the prevalent sickness (fever and ague) in the party, to remove the camp from the malarious banks of the Humboldt near Oreana to the mountains of the same name. We established ourselves in Wright's Cañon. It was a pretty spot, in a wild ravine, through which sparkled a stream of pure water, fringed with luxuriant shrubbery. Among the shrubs were willows, cornels, alders, and buffalo-berry (*Shepherdia*). I noticed a clematis (*Clematis ligusticifolia*) in fruit, and asters and golden-rods were common. The grand old mountains towered above us to about 8,000 feet. Star Peak in this range is 9,960 feet in altitude, which would make a respectable mountain even in New Hampshire! At this camp we noticed a curious phenomenon which at first frightened us all. We perceived at noon that the stream, which had been quite full, became perfectly dry, and we thought that our supply of water was cut off. At night, however, it again ran joyously, and the same thing was repeated every day. This is the result of the tremendous diurnal evaporation, which exhausts all the water before it can reach the valley. No one who has not experienced it can have any conception of the dryness of this region. One's finger-nails crack, wheel-tires come off, and a handkerchief saturated in water and then flung in the air becomes at once bone dry. It is a curious thing that I have had this story questioned, when other tales, savoring of the marvellous, have been swallowed without a sign of suffering.

Sept. 4, 1867. — A series of bold and castellated ridges of granite attracted the attention of our photographer, Mr. T. H. O'Sullivan, and myself; and we determined to climb them. The worst part of the ascent was up a steep hill covered with sage-

brush (*Artemisia*), which led to the base of the rocks. We found the granite wall very fantastic in outline, bold and steep, and with all kinds of curious caves and crannies in it. The rock had been acted upon by the weather in a most peculiar way. The surface of the cliffs in some places looked as if the granite had once been liquid, and a breeze had blown over it, throwing it into waves, and had then fixed these in petrification. It is doubtless due to certain portions of the rock having a more durable composition than the rest, which are eroded, leaving the harder parts in relief. Quite large junipers grew among these rocks, and offered a refreshing shade. I found here a new species of *Iresia*. The wind blew furiously on the top, and, coming to one dangerous-looking place, I felt it incumbent upon me to pause. My companion proceeded, and reported the view very extensive. It certainly was grand from where I beheld it. We desired to go down by another way, but found it rather impracticable, and so returned by the deep ravine in front of the cliffs. The jaunt repaid me in its interesting botany.

*Sept. 5.* — I climbed the mountain again alone, passing up by the stream that I might do better justice to the botany. My ascent was on the opposite side of the cañon from that made yesterday. The descent was the most difficult, as I was obliged to jump from one rough stone to another, at the risk of setting the whole mass in motion. These rocks were a great pile of *débris* from the cliffs.

*Sept. 7.* — I started off immediately after breakfast, and followed up the ridge on the left of the cañon. I enjoyed the extreme solitude of the walk, although it required arduous exertions. I climbed the first ridge of the granite peaks. The scenery of these strange rocks was very fascinating, and the view from them down upon the desert most magnificent. I was seated upon the edge of an abyss, and looked down a thousand feet into a small valley. From thence the main mass of the mountain rolled toward the plain in great brown waves, without a tree or any green thing upon them, unless maybe a straggling juniper. They were covered with sage-brush, but even that is of an ashy color. In fact, the desert plants are marked by their pale hues. The great valley of the Humboldt, stretching to the river and beyond, was equally barren. Then rose the Trinity Mountains, and again other nameless ranges, until a white cap here and there in the dim distance indicated the line of the Sierra Nevada. As I have said, there is no live color in the scene, and yet it does not lack beauty. The

soft shades of neutral tint and azure, and at evening the peculiar golden dust thrown over the mountains, are effects that are unique and unsurpassed. I often found myself dreamily speculating at sunset as to the possibilities that lay beyond "the utmost purple rim." Sometimes I more than half expected to see the celestial city rising, with minaret, dome, and tower.

On Sept. 14, 1867, we broke camp at Wright's Cañon and moved over to Unionville on the opposite or eastern side of the range. My subsequent notes refer to that side of the range only.

Oct. 2. — Mr. Ridgway and myself went up Buena Vista Cañon, and were much impressed by its wild and beautiful scenery. About half-way up the mountain the main branch of the cañon passes between high and rugged walls of trachyte, blackened, and forbidding in color. Leaving the road, we thought we would climb to the base of a bluff which stood out prominently against the steel-blue sky. Ridgway considered the bluff about twenty feet in height. I thought it two hundred; and when we reached it, we both put the height at from four to five hundred. The harmonies are so well preserved in these mountains that one is often so deceived as to height, and the wonderful clearness of the atmosphere renders distance as fallacious. The bluff, which is of limestone, continues along the range for two or three miles or even more. It is perpendicular and very difficult to ascend. We had a hard climb and a most magnificent view. We discovered many singular caves and arches. One cavity under the solid mass of the cliff allowed us to look tremblingly into the abyss below. Near by we killed a large rat with a bushy tail. The wind blew a gale on the top of the cliff, and we considered it unsafe to advance. Juniper and mountain-mahogany (*Cercocarpus*) were common, and also the curious moss-like *Spiraea cæspitosa*. The plants on this side the range are quite different from those I found at Wright's Cañon, and I am informed that it is the rule that the floras of opposite sides of the same range differ materially. We enjoyed a fine view of the desert lying between us and the East Humboldt Range, and also of the great salt flat, looking like a snow-covered plain.

Oct. 3, 1867. — Continued my exploration of Buena Vista Cañon, following the left-hand branch. It was rather late in the season for botanizing. This cañon was rather thickly wooded—that is,

for Nevada—with willows and aspens. I found many pieces of obsidian. It is used by the Pah Ute Indians for arrow-heads.

*Oct. 4.*—I took a long walk across the divide to Coyote Cañon, and obtained a magnificent view of the limestone bluffs, and of Star Peak, rising against a clear sky at a distance of ten miles. It looked at least six miles nearer. Even the ravines and depressions on its sides were clearly discernible. The view upon the desert and the East Humboldts was also grand. We could see the roads crossing the plain and entering the distant mountains, and often a column of dust would rise a thousand feet into the still air. The top of one of the mountains was, or appeared to be, flat. The descent into Coyote Cañon was a rough scramble down sandy and rocky declivities covered with sage-brush. The cañon is itself more fertile than is usual for any district in this country. A stream of water runs through it, fringed by a luxuriant but miniature forest of aspens and other small trees. We had a limited but refreshing lunch near a little spring, shut in by the steep sides of the cañon, at the head of which rose the stupendous wall of limestone.

I remained at Unionville until October 28, when we started for winter quarters at Carson and Virginia Cities. The foregoing notes are offered to the Club in nearly their original form.

---

### Report of the Recording Secretary for 1884.

DURING the past year the increase in the corporate membership of the Club has been small; the losses amounting to 83 and the new members numbering 96, the net gain has been 13. Three Corresponding Members have been elected: General Francis A. Walker, Professor Edward S. Morse, and Dr. E. Behm. The last mentioned died soon after his acceptance of membership. We notice the death of Professor Arnold Guyot, an Honorary Member, and the accession of Mr. John Ball, who accepted honorary membership several years ago, but whose name was accidentally omitted from the list. The Honorary and Corresponding Members now number respectively 10 and 39, and the total membership of the Club is 621.

Art. XI. of the By-laws has been amended by adding: "A quorum of the Council shall not be less than five."

There have been held nine regular, five special, and two field meetings, — sixteen in all; the average attendance upon which has been over one hundred. There were presented at these meetings three reports of Councillors and thirty-seven papers. Ten papers treated some section of the White Mountains, and five were illustrated with the lantern.

For the first time in its history the Club has held a field-meeting outside of the White Mountain region and the suburbs of Boston, the July field-meeting having taken place at Newport, Vt. The September field-meeting was held at Gorham, N. H.

Excursions were made to Turkey Hill in Arlington, Mt. Watatic in Ashburnham, Ossipee Mountain Park, Mt. Belknap, and Lake Winnepesaukee, and to Moose Hill in Sharon. In connection with the field-meetings many excursions were made, including ascents of Owl's Head in Canada, Jay Peak, Mt. Annanance and Bald Hill in Vermont, and Bald Cap and the various summits of the Carter-Moriah Range in the White Mountains.

The annual reception was held January 30, at the Revere House, and was largely attended.

Vol. III. No. 4 of APPALACHIA was issued in April, and Vol. IV. No. 1 in December.

Again we thank the Boston Society of Natural History for the use of an alcove for our library. To the Massachusetts Institute of Technology we are under greater obligation than ever. Upon the completion of the new building the President of the Institute offered us the use of its commodious hall; the Club has thus been able, on several special occasions, to accommodate large audiences.

Respectfully submitted,

ROSEWELL B. LAWRENCE,  
*Recording Secretary.*



### Report of the Corresponding Secretary for 1884.

THE Annual Report of the Corresponding Secretary can of necessity be little more than a *résumé* of the several reports made from time to time at the monthly meetings.

As foremost in importance, it casts a glance at the relations of the Club with societies of similar aims. During the year 1884 these relations have been pleasantly maintained, and in certain instances strengthened. It is especially pleasant to refer to the results of the Club's response to the call for aid sent out by the Società degli Alpinisti Tridentini in behalf of the sufferers by the fire which obliterated the village of Castello. It will be remembered that, thanks to the interested efforts of the gentleman appointed as a committee to solicit subscriptions, the Corresponding Secretary was able to forward a draft for more than a hundred dollars. More gratified doubtless by the expression of sympathy from over seas than for the mere amount of the subscription, the Society at once transmitted, with their thanks, a set of fifty-two photographs of the Alpine region of the Tyrol, the special field of its activity.

Happily opportunities of this kind for emphasizing to foreign clubs our active and sympathetic existence are likely to be of rare occurrence. Beyond the mere interchange of periodicals and circulars of information, but a single way seems open to us for co-operating with the Alpine societies of Europe. This means is the representation of our Club by delegate at the congresses to which we are invited either as guests or accredited participants. It is a just cause for regret that in 1884, as in the preceding year, the lateness of the appointment of our delegate (as in that case, a member already abroad), and his failure to receive notice of his appointment in season, have prevented our deriving the advantage afforded by such representative presence. This year, as last, our misfortune was rendered the greater by reason of the high official character of the chosen delegate. It is rarely that the Club can hope to be represented abroad in the person of its President. We may derive some comfort from

the fact that the important International Congress, appointed to meet in Turin in August, was postponed. It is to be hoped that when it shall meet, — as it probably will in 1885, — the Club may be represented. Involving so great attendant expense, it is hardly to be expected that the Club should draw upon its treasury to the extent of the entire expense of such representation. While it must to a great extent rely upon the good fortune which has for several successive years procured the presence in Europe of one or more of our representative members, it may be well to consider whether the benefits to be derived from this source would not warrant a much larger outlay than has hitherto been considered possible.

But few additions have been made to the number of our corresponding societies. Most of the larger Alpine organizations already appear therein. At the solicitation of Mr. L. L. Hubbard, a well-known member of this Club at present residing at Bonn, Germany, the section of the *Deutscher und Oesterreichischer Alpenverein* located in that place has been placed on our list, though not at present issuing any publications independent of the general organization. Early in the year letters inviting correspondence and exchange of publications were sent to some of the smaller local clubs on the Continent, but no replies have as yet been received; neither has any response been made to a renewed proposition for exchange made to the English Alpine Club.

A larger number of circulars than usual have been received from foreign clubs during the year; chiefly announcements of excursions, conferences, or the formal opening of newly constructed refuges. In this way we have been favored by the *Oesterreichischer Touristen-Club*, the *Oesterreichischer Alpenclub*, the *Deutscher und Oesterreichischer Alpenverein*, the Turin and Vicenza sections of the *Club Alpino Italiano*, the *Società degli Alpinisti Tridentini*, the *Società Alpina Friulana*, and the recently formed *Società degli Alpinisti Triestini*.

Three geographical societies were added to our list during the year, — the *Geographische Gesellschaft zu Greifswald*, in Pomerania (northern Germany), the *Sociedad Geografica de*

Madrid, and the Società Geografica Italiana, having its seat at Rome.

The condition of the library of the Club is only second in importance among matters pertaining to the Corresponding Secretaryship. As heretofore, the principal part of the accessions for the year have been received by way of exchange. A list of these is appended to the present Report. Of the 86 volumes or parts of volumes (327 numbers in all, including 21 maps), 56 volumes and 18 maps have come to us from this source. A few donations have been received. Thanks are especially due to Dr. J. J. Stevenson, Professor R. Pumpelly, Messrs. Samuel Henshaw, and G. M. Jones. At the time of my last Report the number of volumes in the library was stated to be 525; at present they number something over 600. Twenty-six volumes have been bound in the mean time. Although the space required for the library is much diminished by the liberal amount of binding during the past two years, it is necessary to report that our needs are rapidly outgrowing the capacity of the alcove generously placed at our disposal by the Society of Natural History. Already some of its shelves bear a double row of books, those less likely to be called for going to the rear. The difficulty of the situation seems the greater, when it appears that the Society whose hospitality we are enjoying is itself becoming pressed for book space, and as we note at the same time the growth of the sentiment that more direct means should be taken to increase our library by purchase, if need be, of at least the most important current publications upon subjects germane to the work of the Club.

The following is a list of the accessions to the library from various sources during the past year:—

#### FROM CORRESPONDING SOCIETIES.

##### *American.*

*California Academy of Sciences.* — Bulletin, No. 1.

*Cambridge Entomological Society.* — *Psyche*, Vol. II. Index and Title; Vol. III. Nos. 101, 102; Vol. IV. Nos. 115-125. Minutes of Meetings held during 1883.

*Essex Institute.* — Bulletin, Vol. XV. Nos. 7-9; Vol. XVI. Nos. 4-6.

*New York State Survey.* — Annual Report for 1883.

- Torrey Botanical Club.* — Bulletin, Vol. XI. Nos. 1-5, 8-12.  
*United States Department of the Interior.* — [Geological Survey] General Geological Map of the Area explored and mapped by Dr. F. W. Hayden; Report of the U. S. G. Survey west of the 100th meridian, Geology, Supplement, III.; Mineral Resources of the United States. [General Land Office] Fifteen Maps of the States and Territories.  
*United States Department of War.* — Professional Papers: The Motion of Fluids and Solids on the Earth's Surface; Popular Essays on the Movements of the Atmosphere; The Reduction of Air Pressure to Sea Level at Elevated Stations East of the Mississippi.

*Foreign.*

- Associació d' Excursions Catalana.* — Anuari, 1882; Butlletí, VI. 60-73. Homenatge à la memoria di Q. Sella; Lo Llamp y 'ls Temporals.  
*Club Alpin Français.* — (Direction Centrale) Bulletin, 1-6, 8. (Section du Sud-Ouest) Bulletin, 14, 15. (Section Lyonnaise) Bulletin, IV.  
*Club Alpino Italiano.* — (Direzione Centrale) Bolletino, XV., XVI. Rivista, I. 8, 11; II. 11, 12; III. 1-11; Bolletino Decadico, X. 2, 12; XII. 8-12; XIII. 1, 2. (Sezione Fiorentina) Commemorazione di Q. Sella in Firenze; Circolari, 6, 7, 10. (Sezione di Vicenza) Bolletino, VI. 7-12; VII. 1-8; L'Alpinismo nel Veneto.  
*Club Alpin Suisse.* — (Comité Central) Jahrbuch. (Sections Romandes) L'Echo des Alpes, XX. 1-4.  
*Deutscher und Oesterreichischer Alpenverein.* — Zeitschrift, XIV. 2, 3; Mittheilungen, 1883, 10.  
*Den Norske Turistforening.* — Årbog, 1883.  
*Oesterreichischer Alpenclub.* — Oe. Alpen Zeitung, 1883.  
*Oesterreichischer Touristen-Club.* — Oe. Touristen Zeitung, III. 23, 24; IV. 1-24; Chronik, 1883.  
*Siebenbürgischer Karpathenverein.* — Jahrbuch, IV.  
*Società Alpina Friulana.* — Cronaca, III. 1883.  
*Società degli Alpinisti Tridentini.* — Annuario, X.  
*Geographische Gesellschaft zu Greifswald.* — Erster Jahresbericht.  
*Gesellschaft für Erdkunde (Berlin).* — Verhandlungen, X. 8-10; XI. 1-5.  
*Imperatorskoye Rysskoye Geographicheskoye Obshtchestvo.* — Otchet, 1883; Izvestiya, XIX. 3-5; XX. 1-5; Otchet Vostotchnago Sibirskago Otdela, 1883; Otchet Zapadnago Sibirskago Otdela, 1883.  
*Royal Geographical Society.* — Proceedings, V. 12; VI. 1-12.  
*Società Geografica Italiana.* — Bolletino, Ser. II., Vol. IX. 1-12.  
*Sociedad Geografica de Madrid.* — Boletin, XVI. 1-6; XVII. 1-3.  
*Sociedade de Geographia de Lisboa.* — Boletim, 4 Ser. A. 2-7; Expedição Scientifica à Serra da Estrella: Seccão de Medecina, Sub-Seccão de Ophthalmologia; Seccão de Archeologia; Seccão de Ethnographia.  
*Société de Géographie Commerciale de Bordeaux.* — Bulletin, 2<sup>me</sup> Sér. 6 An. 22-24; 7<sup>me</sup> An. 1-24.

## 160 REPORT OF THE CORRESPONDING SECRETARY.

*Société Royale de Géographie d' Anvers.* — Bulletin, VIII. 3-6 ; IX. 1-3; Mémoires, II.

*Société Khédiviale de Géographie.* — Charts pour accompagner 2<sup>me</sup> Sér. 5. *Tokio Daigaku (University of Tokio, Science Department).* — Appendix to Memoirs, Vol. I. Part 1.

*Verein für Erdkunde zu Leipzig.* — Mittheilungen, 1883, 1-3.

### FROM EXCHANGES.

*Deutsche Touristen-Zeitung*, Vol. I. 10-12.

*Outing and The Wheelman*, Vol. III. 4-6; Vol. IV. 2; Vol. V. 1-4.

(*The Wheelman*, Vol. III. 3.)

*Revue Géographique*, 1883, 96-109

### DONATIONS.

*Anales Estadísticas de la Republica de Guatemala*, Tomo I.

*Appalachia*, Vol. III. 2, 3; Vol. IV. 1.

*Arctic Drift and Ocean Currents.*

*Banyuls-sur-Mer: Histoire Naturelle; Ethnographie; Climatologie.*

*Bulletin of the Essex Institute*, Vols. I. -VI., VII. 4-12.

*Baltimore and its Neighborhood (map.)*

*Das Riesengebirg in Wort und Bild*, III. Jahrgang, 1, 2.

*Der Ortler*, J. Meurer.

*Harvard University, Bibliographical Contributions*, No. 16.

*Jahrbuch des Schweizer Alpenclub*, Bd. III.

*Northern Transcontinental Survey: (maps) Forest Dept., Bulletin No. 1; Agricultural Dept., Bulletin No. 1; Topographical Dept., Bulletin No. 1.*

*Proceedings of the Rutland Co. (Vt.) Historical Society.*

*Profile Mountain (plate, from Silliman's Journal, 1827).*

*Schweizerische Landesausstellung, 1883. Special-catalog für Gruppen 27, 28, and 42. Forstwirthschaft, Jagd, und Fischerei.*

*Science Record*, Vol. II. 12.

*Second Geological Survey of Pennsylvania, Reports K, K<sup>2</sup>, K<sup>3</sup>, T<sup>2</sup>.*

*Tavole-Prontuario da 1 a 5,000 metri, per la misura delle Altezze col mezzo del Barometro*, — F. Salino.

*The Franconia Flume.*

*The Shoaling of the Bar at the Entrance of San Francisco Harbor*

*The Tourist Journal*, Vol. I. No. 1.

*Visite des Membres du Congrès de Géographie de Douai, 1883.*

Respectfully submitted,

CHARLES E. FAY,

*Corresponding Secretary.*

**Treasurer's Report for 1884.**

THE receipts for the year ending Dec. 31, 1884, were as follows: —

From balance on hand Dec. 31, 1883 . . . . .	\$1145.59
" admission fees from 95 new members . . .	\$285.00
" assessments from 7 members for 1883,	
" " 353 " " 1884,	
" " 3 " " 1885,	
making a total of 363 members at \$3 . . .	1089.00
" payments of I. Y. Chubbuck and Mrs. F. J. Chapin at \$30 each for Life Membership . .	60.00
" APPALACHIA, sales of copies . . . . .	93.51
" donation from James R. Carret . . . . .	1.00
" balance returned by the Committee on Annual Reception and Entertainment . . . . .	26.80
" balance returned by the Committee on Field Meetings and Excursions . . . . .	11.47
" interest on deposits in Savings Bank and on loans . . . . .	53.29
	<hr/>
	1620.07
	<hr/>
	\$2765.66
	<hr/>

The payments for the year ending Dec. 31, 1884, were as follows: —

Paid for postage and stationery . . . . .	\$181.46
" for printing and advertising . . . . .	201.03
" for clerical services —	
for Secretary . . . . .	\$26.62
for Treasurer . . . . .	16.00
for Janitor, and illustrating . . . . .	15.00
	<hr/>
	57.62
" for APPALACHIA — for 3 Numbers, viz.:	
1,100 copies, Vol. III. No. 3 . . .	\$387.08
1,000 " Vol. III. No. 4 . . .	338.84
1,000 " Vol. IV. No. 1 . . .	326.08
Title and Index, Vol. III. . . . .	42.50
Binding, Delivery, &c. . . . .	82.03
	<hr/>
	1176.53
" Suffolk Savings Bank for Permanent Fund . . .	113.42
" Department of Improvements . . . . .	21.00
" Appalachian Mountain Club Library . . . . .	58.10
	<hr/>
	\$1809.16
Balance . . . . .	956.50
	<hr/>
	\$2765.66
	<hr/>

The undersigned have examined the accounts of Charles W. Kennard, Treasurer of the Appalachian Mountain Club, for the year 1884, and find them properly kept and correctly balanced, with satisfactory vouchers for all payments. The assets of the Club are

Permanent Fund . . . . . \$755.14  
Cash in hands of Treasurer . . . . . 956.50

R. F. CURTIS,  
GARDNER M. JONES, } *Auditors.*  
H. C. DODGE,

Boston, Jan. 12, 1885.

### STATEMENT OF RECEIPTS FOR FIRST NINE YEARS.

YEAR.	MEMBERSHIP.					Sales of Appalachia.	Interest.	Donations.	Life Membership.	Annual Reception.	Field Meetings and Excursions.	Total.
	Admission Fee.	Yearly Assessments.	Back Assessments.	Advance Assessments.	Total.							
1876	262.00	....	....	....	262.00	43.00	....	....	....	....	....	296.00
1877	62.00	248.00	12.00	....	312.00	98.00	....	....	....	....	....	410.00
1878	76.00	226.00	16.00	....	318.00	76.09	....	43.00	60.00	....	....	497.09
1879	148.00	230.00	40.00	....	418.00	130.00	2.00	222.00	....	....	....	802.00
1880	178.00	336.00	24.00	....	538.00	117.00	11.00	86.00	90.00	....	....	842.00
1881	222.00	384.00	18.00	12.00	636.00	141.00	17.59	62.55	120.00	....	....	977.04
1882	266.00	628.00	74.00	....	968.00	309.43	22.07	2.00	90.00	....	....	1281.50
1883	385.00	1000.00	20.00	27.00	1442.00	197.58	39.72	24.00	210.00	27.00	82.88	2021.18
1884	286.00	1069.00	21.00	9.00	1374.00	93.51	53.29	1.00	60.00	26.80	11.47	1620.07
Total	1862.00	4041.00	225.00	48.00	6178.00	1206.61	145.67	438.55	630.00	53.80	94.35	8745.88

### STATEMENT OF EXPENDITURES FOR FIRST NINE YEARS.

YEAR.	Permanent Fund.	Postage, Stationery, etc.	Miscellaneous Printing.	Appalachia.	Topographical Department.	Art Department.	Improvements and Exploration.	Clerical Expenses.	Field Meeting Expenses.	Annual Reception.	Library.	Total.
1876	....	36.00	74.00	141.00	....	....	15.00	....	....	....	....	266.00
1877	....	39.00	84.00	364.00	....	18.00	....	....	....	....	....	500.00
1878	....	84.00	161.00	200.00	2.00	63.00	20.00	....	....	....	....	520.00
1879	60.00	63.00	96.00	240.00	19.00	....	159.00	....	....	....	....	612.00
1880	90.00	77.00	109.00	290.00	19.00	....	73.00	....	....	....	....	686.00
1881	120.00	199.22	194.87	246.23	37.96	....	68.00	19.75	22.70	....	....	908.72
1882	90.00	143.69	115.40	675.93	25.40	....	....	84.50	25.00 <sup>1</sup>	....	....	1109.82
1883	281.72	190.18	199.55	396.27	23.65	....	160.37	67.41	1.33	17.28	69.78	1377.69
1884	113.42	181.46	201.03	1176.63	....	....	21.00	67.62	....	....	58.10	1809.16
Total	755.14	1016.45	1234.85	3699.96	127.00	66.00	516.37	179.28	49.08	17.28	127.88	7789.29

<sup>1</sup> Expense of Delegate to Milan.

After more than three years' services as Treasurer, I now resign its duties to other hands. I recommend that hereafter all sums which have been received from admissions, as well as future income from that source, be invested, and with interest from the same be added to our Permanent Fund, which now consists of \$630, being the Admission Fees from 21 Life Members, at \$30 each, and the sum of \$125.14 received for interest, making a total of \$755.14 deposited in the Suffolk Savings Bank at this date.

The usefulness of the Club hereafter will, in my opinion, be much enhanced by the help coming from a well-established fund. I also think the Council should appoint a Finance Committee.

Respectfully submitted,

CHAS. W. KENNARD, *Treasurer.*

---

## Reports of the Councillors for the Spring of 1885.

### Topography.

By A. E. BURTON.

THE making of an accurate and serviceable map of the White Mountain Region of New Hampshire was one of the primary objects in the formation of the Appalachian Mountain Club. Something has been done toward the accomplishment of this object nearly every year, and now there is enough material on hand to fairly warrant publication. The work is by no means complete. The map which we can offer, at present, will be but the merest skeleton, but it will contain the information most desired by the members of the Club; and therefore, as Councillor of Topography, I feel that the efforts of the Department during the present year should be mainly directed, not to the accumulation of new data, but rather to the arrangement and publication of the old. In order to accomplish this work, an especial appropriation of \$100.00 is solicited for the purpose of defraying the necessary expenditures for drawing and computation. The details in regard to the manner and cost of publication have not yet been decided upon.

In addition to this map work, it is proposed that the



material collected by Mr. I. Y. Chubbuck, Mr. E. G. Chamberlain, and other members of the Club, be utilized in the making of alterations and additions on the old map of Boston and vicinity, published by Cupples, Upham, & Co.; this to be done without expense to the Club.

It is intended to make a trip to Mt. Ktaadn, Maine, early this fall, for the purpose of making a more accurate map of the immediate vicinity of the mountain. The appropriation to the Department of Topography made at the beginning of the year will be expended in connection with this expedition.

---

## **Reports of the Councillors for the Spring of 1885.**

### **Exploration.**

By E. B. Cook.

THE Councillor of Exploration, in accordance with the duty of his office, has the honor of suggesting to the Council some desirable points of attack for the campaign of the coming summer.

In the number of APPALACHIA for June, 1880, Mr. W. H. Pickering gave an extended "Table of the Less-Visited Peaks of the White Mountains." When the present Councillor entered upon office, there still remained thirteen of these peaks lacking the recording pen of an explorer; but during the past two years all of these mountains have been described in APPALACHIA.

Mr. De Pourtalès, in the first number of the first volume of APPALACHIA, presented a list of thirteen districts in which exploration was particularly desirable. In the first number of Vol. II. of our magazine, Professor Fay set forth what had then been done in the various districts. It seems well to examine into what now remains requiring especial investigation. In the first district, "the region north of Dixville Notch," Professor Huntington has bestowed his attention upon its geology, has explored the sources of the Connecticut

River, and has run the boundary line of the State ; but an extensive wilderness, embracing many streams and mountains, gives promise of containing many objects of attraction. South of the Dixville Notch, and between it and the Pilot Range, are a number of eminences that challenge a visit, especially a peak in Erving's Location, which is said to reach a height of 3,156 feet. The second district is "the Pilot Range," and upon this region the writer hopes to bestow his attention during the approaching summer. In the third district, which includes the Pliny and Randolph Mountains, Round Mountain still calls for investigation. In the fourth district, "the country north and east of the Androscoggin," there is much to be explored. At the Rangeley Lakes, Saddleback Mountain, with a lake upon its shoulder, and Bald Mountain, standing between Rangeley and Mooselucmaguntic Lakes, seem to promise magnificent views. In the fifth district, "east of the Wild River and south of the Androscoggin," the remarkable crest of Red Rock Mountain invites inspection. To the east of it is Miles' Notch, which separates Red Rock from Bear Mountain. To the southward of the eighth district, an explorer could devote attention to "the Ridge of the Caps" on Mt. Jefferson, and to the head of the ravine between Jefferson and Clay. In the eleventh district, "between Mts. Lafayette and Willard," Mts. Thompson and Hastings still lack particular description. In the thirteenth district, "the region between Moosilauke and Cannon Mountains," the second peak of Mt. Kinsman deserves a visit; and there are many interesting lesser mountain-tops toward Kinsman Notch, which itself merits scrutiny.

Looking westward from Moosilauke last autumn, an enticing excursion seemed to be a transit of Black Mountain, Sugar Loaf, Hog's Back, Blackberry, and Owl's Head, in succession. As the estimated height of Mt. Anderson seems to do injustice to its nearest neighbors, the writer hopes to traverse Mts. Nancy, Anderson, and Lowell, in sequence, next summer, when it is hoped the index of an aneroid may point out the truth in the relative heights.

In examining accounts of mountains which have already been described in APPALACHIA, the reader may find points

lacking or needing further elucidation ; and members of the Club are reminded that it is always in order to increase the store of knowledge we possess.

---

## **Reports of the Councillors for the Spring of 1885.**

### **Improvements.**

**By I. Y. CHUBBUCK.**

WITH the present age of the Club, it is very important that the work of the department of Improvement should not be lost sight of. Unlike the other departments, the labors of this one increase in a proportion greater than the ordinary growth of the Club or added years would seem to indicate. There must be a review of the past Councillors' duties from the first years of the Club. Any neglect of paths, camps, openings, record bottles, springs, or lesser details is money and labor lost. Nature is at work while man sleeps. By lack of use and want of proper care, an ordinary path in a section of country not much frequented, becomes extinct in a few years, and a camp a mass of ruins.

We have now paths on and over many of our principal White Mountain summits, camps in several localities, and a large number of record bottles placed. For the coming season we would recommend that general repairs should be, as far as possible, the chief end in view ; and in order that the work may receive the attention necessary, we feel that now or in the near future there should be a division of the region where many of our paths have been built, into sections, each of which shall have a person belonging to that section, employed each year to look after and keep the paths and camps in good repair ; that person to be under the supervision of the Councillor of Improvements, or some member of the Club whom the Councillor may appoint. We feel that by this method nearly every path will receive attention some time in the year ; whereas, with the yearly addition of the new with

the old work, it is becoming almost impossible for the Councillor to visit the different sections, without incurring considerable expense and consuming a large amount of time.

The Mt. Adams path, with its branches, should be looked after. The increasing travel over these paths each succeeding year will help very materially in keeping them in condition, but still there must be a general bushing and clearing out in order that they may be up to the standard of good Appalachian paths. We desire that this may be done, and that the camp may have all needed repairs and be put in good condition for occupancy.

The path from Thornton through to the base of Moosilauke is an important one, but on account of extensive lumbering operations in that region, portions of it have become almost obliterated. It seems hardly advisable to spend any money in that direction, as the lumber roads in the future may become thoroughfares, and can then be utilized as far as they go.

From Waterville to Livermore is a path of especial interest to the Club, and we are informed that it is in very bad condition ; so much so, as to necessitate quite an outlay of money to put it in passable condition. It is possible that an extra appropriation may be required for this purpose. I desire that this path, with the branch up Mt. Carrigain, may be put in good condition, the work given to some competent person to prosecute, bushing out and blazing when necessary, and fixing signs at all doubtful places. The path from Waterville over the mountains to the head of the Swift River Valley should receive attention. In times past considerable travel has passed over this route, it being the most direct way from Waterville or Campton to Conway ; but this being an old trail and not a Club path, it may not be advisable to incur any large expense in that direction. The camp in Tuckerman's Ravine should be put in good repair especially, as the path through to the head wall and up Mt. Washington is much travelled.

If many of our members who spend their summers among the White Hills would assist in the work of this department, their services would be highly appreciated. Many of our paths will need but little attention, owing to the increasing

summer travel over them, while others must be looked after each year. We have paths near many of the summer resorts, and a little bushing out and sign placing could be done very easily.

For new work, a path has been projected that opens a new region to many of the Club members, — that over the Carter-Moriah Range. Some money has been subscribed toward cutting it through and for building two camps on the route, and we hope that additional means will be handed in so that the path can be well cut and the camps built in a substantial manner. Some work has been done at both ends in previous years, and we intend this summer to open it over the whole range, one camp to be built in a ravine just south of the summit of Mt. Moriah, and the other in the col between Mt. Carter and Carter Dome. Water can be found in various places on the route. This path, with its camps, will give parties an opportunity to spend considerable time on the Range, to enjoy the prospect from the various summits and openings, or in the pursuit of any Club work.

In the matter of repairs many of the minor paths could be named that should receive attention, but we feel that this can be best accomplished by a division of the labor as previously noted.

---

### Proceedings of the Club.

December 9, 1884 (Evening). — Special Meeting.

President Scott in the chair.

ABOUT one hundred and fifty persons were present.

Lieutenant Frederick Schwatka, U. S. A., the noted Arctic explorer and a Corresponding Member of the Club, delivered a lecture on "Alaska." His explorations were made under the direction of the United States Government, between June 13 and Aug. 6, 1883. From the headwaters of the Yukon River he made a voyage of nearly 1,300 miles upon a raft, 15 × 30 feet; one fourth of this distance never having been explored. He described the Grand Cañon as a deep gorge with high basaltic walls resembling those of Fingal's Cave. His passage of the rapids was very exciting; but most of the trip was quite tame, the country being low and marshy and terribly infested by insects, which fact accounts for the

entire absence of game. He also described the Aleutian Islands and their climate, and closed by prophesying a grand future for Alaska, with its fisheries of cod, seal, salmon, and whales, its precious metals, timber, and grazing-grounds.

December 18, 1884. — Sixty-first Corporate Meeting.

Professor William H. Niles in the chair.

About one hundred persons were present. Twenty-eight nominations to membership were presented.

It was voted that the Club hold a reception as in previous years, and that the President be requested to appoint the usual Committee. The following Committee was subsequently appointed: Cornelius Wellington, J. Ritchie, Jr., Miss Helen M. Ireson, Miss Rose Hollingsworth, W. B. Parker.

The Chairman, Professor Niles, then alluded in beautiful and appropriate remarks to the loss which the Club had just sustained in the death of Miss M. F. Whitman.

A recess was then taken while the screen was being placed in position; after which the Chairman referred to the generous gift which Mrs. E. A. Lane had made to the Club, consisting of forty lantern slides, representing scenery on the Pacific Coast. The photographs were taken by Mrs. Lane herself, she having visited the Yosemite Valley several times and Mt. Whitney four times. While the views were being thrown upon the screen, a description prepared by Mrs. Lane was read by the Recording Secretary. Upon the motion of Professor C. E. Fay, a vote of thanks was passed to Mrs. Lane for her valuable gift and for the entertainment.

Rev. John Worcester then showed upon the screen some fine views taken upon Mt. Madison and at North Conway.

Professor Niles showed four Swiss views, and explained the phenomena of the afterglow.

The remainder of the evening was spent in examining a large collection of photographs of mountain scenery. Many of these were kindly loaned for the occasion by members of the Club. Conspicuous among the photographs belonging to the Club was the fine series of views in the Tyrolese Alps, received as a gift from the Società degli Alpinisti Tridentini.

January 8, 1885 (Evening). — Special Meeting.

President Scott in the chair.

An illustrated lecture, entitled "A Summer Trip to Alaska," was given by Mr. Thomas W. Bicknell. The topics treated were the topography of the Northern Pacific Railroad, the approach to Alaska, the coast scenery, the products, mines, and fisheries of the Territory, and the characteristics and customs of the people. About sixty pictures were thrown upon the screen. Two hundred and fifty persons were present.

January 14, 1885. — Sixty-second Corporate (Annual) Meeting.

President Scott in the chair.

About ninety persons were present. The candidates for corporate membership presented at the last meeting, twenty-eight in number, were elected. Henry Gannett, of Washington, D. C., and Miss Lucy Larcom, of Beverly, were nominated for corresponding membership; and seven candidates for corporate membership were nominated.

The Recording Secretary, Corresponding Secretary, and Treasurer presented their annual reports.

Professor William H. Niles, Chairman of the Committee appointed to nominate Officers for the year 1885, reported — the place of Councillor of Natural History being left vacant. The report was accepted, and upon ballot the following officers were elected: President, Thomas Wentworth Higginson; Vice-President, J. Rayner Edmonds; Recording Secretary, Rosewell B. Lawrence; Corresponding Secretary, Charles E. Fay; Treasurer, Gardner M. Jones. Councillors: Natural History, William H. Niles; Topography, Alfred E. Burton; Art, William H. Pickering; Exploration, Eugene B. Cook; Improvements, Isaac Y. Chubbuck.

President Higginson being absent, Vice-President Edmonds took the chair.

A paper illustrated with the lantern, and entitled "An Ascent of Vesuvius on the Pompeian Side," was given by Mr. William H. Pickering. Besides views of the mountain and its crater, views were shown of Pompeii and the Bay of Naples.

February 13, 1885 (Evening). — Sixty-third Corporate Meeting.

President Higginson in the chair.

The President opened the meeting with an address, referring pleasantly to his election and to the great prosperity of the Club. He then proceeded to explain and advocate a plan for securing a room as a headquarters for the Club, and closed by offering to be one of ten who should subscribe the amount necessary to pay the rent for two years.

Two hundred and thirty persons were present.

Professor Niles having declined his election as Councillor of Natural History, Mr. George C. Mann was elected to fill the vacancy.

Mr. Henry Gannett, of Washington, D. C., and Miss Lucy Larcom, of Beverly, were elected Corresponding Members. The candidates for corporate membership presented at the last meeting, seven in number, were elected. Nine nominations for corporate membership were presented.

Rev. A. E. Winship delivered a lecture on Colorado, New Mexico, and Utah, illustrated by seventy stereopticon views. The scenery illustrated comprised Marshall Pass, Grand Cañon, Royal Gorge, Toltec Gorge, Pike's Peak, Clear Creek Cañon, Manitou, Ute Pass, Cheyenne Cañon, Garden of the Gods, Colorado Springs, Denver, Santa Fé, Pueblos, Salt Lake City, Echo Cañon, Weber Cañon, etc.

March 11, 1885. — Sixty-fourth Corporate Meeting.

Vice-President Edmands in the chair.

Seventy-five persons were present. The candidates for membership presented at the last meeting, nine in number, were elected. Twelve nominations were presented.

The Corresponding Secretary reported the acquisition of the Club Alpin Belge and the Nederlandsch Aardrijkskundig Genootschap to the list of corresponding societies. A letter was presented from the President of the Turin Section of the Italian Alpine Club, announcing the opening of a subscription under its auspices in behalf of the sufferers by the recent avalanches in Piedmont, and soliciting aid in behalf of this object. The Corresponding Secretary remarked upon the urgency of the need, and advocated a generous response to the appeal. Mr. S. A. Drake moved that the subject be referred to the Council. Mr. R. F. Curtis moved to amend by adding an expression of warm sympathy and a request that the Council make a suitable appropriation for the purpose. The amendment was accepted, and the motion as amended was carried. The Treasurer was constituted a committee to receive individual subscriptions.

Mr. C. E. Ridler read an interesting paper entitled "Some of the Hills of Plymouth County." He alluded to many historical incidents, mentioned the hills used as stations of the Coast Survey, and described several views; that from Monk's Hill in Kingston being perhaps the most interesting. He expressed the hope that the Club might make an excursion to Monk's Hill. Mr. S. A. Drake then spoke of the poetical legends of the Plymouth Hills, and of the inspiration we receive from "The Old Colony."

Mr. E. G. Chamberlain read a paper entitled "Altitudes in Massachusetts, with a Sketch of the Massachusetts Trigonometrical Survey conducted by Simeon Borden, 1830-1840." (See p. 132.)

Professor George Davidson, of San Francisco, a Corresponding Member of the Club, was then introduced. He spoke of the work done by the Borden Survey, with which he was himself connected, and said that Borden's ability was in advance of his instruments. Professor Davidson then described his own remarkable work in California, and stated that he was now preparing to carry the triangulation from the Pacific to the Atlantic.

Professor Henry F. Walling then spoke of the survey now in progress in Massachusetts, and especially of the new legislation concerning town boundaries.

A paper written by Rev. Harry P. Nichols, and entitled "A Week in the Pemigewasset Wilderness," was read by Mr. R. F. Curtis. The party ascended Hancock and Carrigain, and passed over the Twin Range by the Club path. The remarkable views from Carrigain and Bond were described, and the time spent in going from point to point on the Twin Range was given.



March 20, 1885 (Evening). — Special Meeting.

President Higginson in the chair.

One hundred and twenty-five persons were present. The President announced the progress made by the Committee on Permanent Accommodations, and the action which had been taken in favor of the sufferers by avalanches in Italy.

Mr. A. E. Scott read a paper entitled "The Scottish Highlands, including an Ascent of Ben Nevis." He compared the scenery about Lochs Lomond and Katrine with that along the Caledonian Canal and in Glencoe, and illustrated his paper with fourteen stereopticon views and a map. The account of his trip was replete with allusions to the poetry and romance of the Scottish Highlands.

Mr. Rosewell B. Lawrence gave an account of a trip "From the Sources of the Connecticut to the Rangeley Lakes." The paper gave a partial description of the geography of the region, and mentioned some camp experiences. (See p. 105.)

Captain Fred. C. Barker, of Camp Bemis, on Moosetocmaguntic Lake, was introduced, and showed upon the screen some beautiful views of the Rangeley Lake region.

April 8, 1885. — Sixty-fifth Corporate Meeting.

President Higginson in the chair.

Eighty-five persons were present. The candidates for membership presented at the last meeting, twelve in number, were elected. Ten nominations were presented.

The President reported progress in the subscription in aid of the sufferers by avalanches in Piedmont. He also mentioned the progress made by the Committee on Permanent Accommodations.

Mr. W. M. Davis presented a communication on "Geographic Evolution," his purpose being to show how physical forms on the earth's surface have been evolved. He said that by erosion the land is carried into the sea, but that this process cannot make the land lower than the "base level," the level of the sea. He then proceeded to show how stratified deposits accumulate under the water; that these are gradually elevated above the sea; that they are cut through by rivers which thus form valleys and cañons; and that, as the process of denudation continues, table-lands are left rising above the surrounding country, until finally the whole surface is reduced nearly to the base level. He also explained the physical forms caused by lava streams and glaciers. The paper was illustrated by diagrams and models.

Mr. Frederic Gardiner, Jr., described a trip on horseback in Arizona. He explained the physical features of the country, described the vegetation, cliff dwellings, and pueblos, and exhibited lantern views of scenery

on the Navajo Reservation and on Walnut Cañon and the Grand Cañon of the Colorado. In his descriptions Mr. Gardiner referred to Mr. Davis's diagrams, and the lantern views were in turn excellent illustrations of the forms and changes described by Mr. Davis. The two communications thus united to furnish an instructive and entertaining meeting.

April 16, 1885 (Evening).—Special Meeting.

Vice-President Edmands in the Chair.

Mr. J. Ritchie, Jr., exhibited some lantern views of the Appalachian region in Virginia, which had been visited by himself and a party—a large proportion of which consisted of members of the Club—in the summer of 1884. The geographical features were commented upon, and some reference was made to the geology of the region. The paper was largely descriptive of the resorts of the country, especial mention having been made of Afton, on the summit of the Blue Ridge, White Sulphur Springs, on high land (2,000 ft.) west of the Alleghanies, Kanawha Falls, central in the hilly region of West Virginia, Natural Bridge, and Luray, among the mountains. The availability of these resorts for summer travellers was fully set forth; the climate being described as not unlike that of northern watering-places. The pictures which were projected (some fifty in number) illustrated features none of which had been previously photographed, and were taken during the trip by Mr. Ritchie, Mr. E. F. Wilder, and other amateur photographers who were of the party.

May 11, 1885. — Sixty-sixth Corporate Meeting.

Vice-President Edmands in the chair.

Mr. Samuel H. Scudder read an account of "A Winter Excursion to Tuckerman's Ravine." (See p. 124.) Mr. Scudder exhibited some photographs taken by himself during the trip. He also presented to the Club ten views taken by Lieutenant Schwatka on the Yukon River.

Fourteen views taken last January in King's Ravine were presented to the Club by Mr. W. B. Clarke.

The Corresponding Secretary announced the receipt from Miss M. F. Curtis of three views of Pike's Peak, taken from the Garden of the Gods. He also reported the acceptance by Mr. Lucius L. Hubbard of his appointment as delegate to an Alpine Congress at Villach, Germany. In view of the valuable gift of publications received from the Geographical Society of the Netherlands, the Secretary suggested the desirability of sending to that Society one of the few copies still remaining of APPALACHIA, Vol. I. No. 1. This matter was referred to the Council. The Secretary also announced the receipt of the usual exchanges, of the accep-

tance of an invitation to exchange of publications by the Hungarian-Carpathian Club, of a letter accompanied by a donation of maps from Mr. Henry Gaunett, and of a letter from Mr. Ernest B. Pratt, a member of the Club, concerning his proposed trip in July to the Virginias.

Upon invitation Mr. Pratt explained his plan. He stated that he hoped to present to the Club a collection of one hundred and fifty views of Virginia scenery, and concluded by inviting the members of the Club to join his party.

The candidates for membership presented at the last meeting, ten in number, were elected. Twenty-seven nominations were presented.

A paper by Mr. F. H. Chapin entitled "An Ascent of the Zinal Rothhorn" was read by Professor Fay. (See p. 97.)

Remarks were made by several members of the Club.

The Recording Secretary read extracts from the spring report to the Council of Mr. E. B. Cook, suggesting work for the season in the Department of Exploration. (See p. 164.)

#### June 10, 1885. — Sixty-seventh Corporate Meeting.

President Higginson in the chair.

Forty persons were present. The President announced progress in collecting subscriptions for the rental of a room. The candidates for membership presented at the last meeting, twenty-seven in number, were elected. Fifteen nominations were presented.

Fifty views taken in Middlesex Fells by Mr. George E. Davenport were exhibited and explained by the Recording Secretary. A sketch map of the Fells was drawn upon the board, and points of interest — hills, ponds, paths, etc. — were located. Remarks were made by Mr. Elizur Wright upon the character of the Fells, and the project of reserving the district for a natural park.

Mr. W. H. Ladd read a paper written by Dr. Samuel Kneeland, describing a visit by him to the crater of Kilauea, in the Sandwich Islands.

**Officers for 1885.***President.*

THOMAS WENTWORTH HIGGINSON, 25 Buckingham Street, Cambridge.

*Vice-President.*

J. RAYNER EDMANDS, Harvard College Observatory, Cambridge.

*Recording Secretary.*

ROSEWELL B. LAWRENCE, 23 Court Street, Boston.

*Corresponding Secretary.*

CHARLES E. FAY, Tufts College, College Hill.

*Treasurer.*

GARDNER M. JONES, Post Office Box, 2114, Boston.

*Councillors.*

*Natural History*, GEORGE C. MANN, Glen Road, Jamaica Plain.

*Topography*, ALFRED E. BURTON, Massachusetts Institute of Technology, Boston.

*Art*, WILLIAM H. PICKERING, Massachusetts Institute of Technology, Boston.

*Exploration*, EUGENE B. COOK, 26 Hudson Street, Hoboken, N. J.

*Improvements*, ISAAC Y. CHUBBUCK, 15 Georgia Street, Roxbury.

**Members added since Dec. 29, 1884.****CORRESPONDING MEMBERS.**

Gannett, Henry, Washington, D. C.

Larcom, Lucy, Beverly.

**CORPORATE MEMBERS.**

Atkins, Miss Helen L., Boston.

Bartlett, George A., Cambridge.

Barton, George H., Boston.

Bailey, Mrs. Fannie D., Newton.

Bayley, Charles H., Boston.

Bailey, John L., Newton.

Bicknell, Thomas W., Dorchester.

Bailey, Miss Sibylla A., Boston.

Briggs, George L., Brookline.

Baker, L. H., Bridgeport, Conn.

Calder, Miss Edna F., Dedham.

Barrows, S. J., Boston.

Cartwright, James W., Boston.

Barrows, Mrs. S. J., Boston.

- Cartwright, Mrs. J. W., Boston.  
 Chandler, Milton A., Boston.  
 Clarke, Miss M. A., Boston.  
 Cobb, John Storer, Boston.  
 Codman, Mrs. A. F. T., Neponset.  
 Crosby, Mrs. Eleanor F., South Boston.  
  
 Davis, William Morris, Cambridge.  
 Deming, Miner R., Jamaica Plain.  
 Dickinson, G. K., Jersey City, N. J.  
 Durgin, S. H., Boston.  
 Durgin, Mrs. S. H., Boston.  
  
 Emery, Woodward, Boston.  
  
 Fiske, Miss Abbie W., Boston.  
 Flint, Warren F., Somerville.  
 Ford, Mrs. George W., Medford.  
 Foster, Frederick A., Boston.  
 Frazer, Miss Eliza F., Cambridge.  
  
 Gates, Carroll Warfield, Monterey, Cal.  
 Greenough, James B., Cambridge.  
  
 Hall, Charles C., Boston.  
 Hall, Mrs. Charles C., Boston.  
 Hardwicke, Charles H., Quincy.  
 Hardwicke, Miss M. Elizabeth, Quincy.  
 Harris, William T., Concord, Mass.  
 Hatch, William E., Milford, Mass.  
 Hathaway, Mrs. Mary M., Howard, R. I.  
 Hewins, Eben N., Boston.  
 Hornbrooke, Francis B., Newton, Mass.  
 Howe, Miss Camelia A., Brookline.  
  
 Kidner, Reuben, Boston.  
 King, Miss S. Frank, Dorchester.  
 King, Miss Sophie, Dorchester.  
  
 Lyon, David, Newark, N. J.  
  
 Mann, Mrs. Esther L., Jamaica Plain.  
 Marsh, Miss Elizabeth L., Boston.  
 Martel, Edouard Alfred, Paris, France.  
 Mathews, Ferd. Schuyler, Boston.  
 Morse, Miss Alice W., Roxbury.  
 Morse, Miss Grace E., Roxbury.  
 Morse, H. F., Roxbury.  
  
 Newhall, Cheever, Dorchester.  
  
 Parris, Percival J., New York, N. Y.  
 Peirce, James Mills, Cambridge.  
 Pinkham, Henry M., Somerville.  
 Pinkham, Mrs. H. M., Somerville.  
 Pratt, Ernest B., Jamaica Plain.  
 Pumpelly, Raphael, Newport, R. I.  
 Putnam, Miss Lucy A., Arlington Heights.  
  
 Rumrill, Miss Sarah E., Roxbury.  
  
 Sewall, James W., Old Town, Me.  
 Seymour, Charles R., Winchester.  
 Smith, George O., East Lexington.  
 Staples, Miss F., Cambridge.  
 Stearns, Charles H., Brookline.  
 Stearns, Mrs. C. H., Brookline.  
 Stone, Henry, South Boston.  
  
 Taft, Charles E., Dedham.  
 Temple, W. F., Boston.  
 Thackray, Miss Emily A., Brooklyn, N. Y.  
 Thompson, Miss Mary F., Boston.  
 Tyler, Harry W., Ipswich.  
  
 Webster, Miss Frances M., Boston.  
 Webster, Miss Mary Alba, Boston.  
 White, Elisha M., Boston.  
 Wilson, Miss Alice L., Boston.  
 Wilson, H. C., Watertown.  
  
 Yendell, Mrs. Paul S., Dorchester.

# APPALACHIA.

---

VOL. IV.

BOSTON, MARCH, 1886.

No. 3.

---

## The Tripyramid Slides of 1885.

BY ALFORD A. BUTLER.

Read December 11, 1885.

THE year 1869 is remembered, throughout the western portion of the White Mountains, as the year of the great storm of the 4th of October. In that storm occurred the first slide<sup>1</sup> on the southern slope of Mt. Tripyramid. Commencing about fifty rods below the summit, it exposed the bed-rock of the mountain to the brook-bed at its base, a half-mile below. This exposure, beginning at a sharp apex, widens irregularly as it descends, being broadest (twenty-five or thirty rods) three eighths of a mile down. At the base of the mountain, where it turned at a right angle to follow Norway Brook, it narrowed to seventeen rods. Its destruction and débris covered the brook for over two miles. It has been known as "the great slide of 1869." It is the purpose of this paper to describe the greater slides of 1885.

The first half of August, 1885, was very wet throughout the whole of this section. On the 10th there was rain the most of the day. On the 12th there was a quiet, persistent rainfall all day and almost all night. The morning of the 13th was showery, and at 1 P. M. it began to pour. The black clouds hung low and motionless; their contents fell as great drops, then as sheets of water, then a very flood. At Water-

<sup>1</sup> See APPALACHIA, vol. i. p. 14; vol. ii. p. 47.

ville the steep hillsides were white with miniature brooks and cascades, and the dry meadows were filled with large streams. Two gentlemen returning from fishing about 3 P. M. reported the streams unfordable and rising with wonderful rapidity. After three hours of this astonishing down-pour the rain ceased, and we went forth to see Mad River at the dam.

The old dam is some one hundred and fifty feet long, and the fall about twelve feet. Except at the spring and autumn floods the dam is high and dry; a break near its western end making an outlet for the stream, whose usual summer volume would flow through a four-foot main. Arriving at the river, we saw a rushing torrent stretching from bank to bank, and covering the dam so deep that only a series of rapids indicated its position. The immense volume of the water was a surprise; its appearance was an astonishment. We expected dark water; we found it black in color and like thick chocolate in consistency. It was a boiling torrent of mud, with mud waves and mud spray. In its power and madness it was a one-hundred-and-fifty-foot section of the rapids above the Sister Islands at Niagara. The strange color and consistency of the flood, its hurrying burden of driftwood, logs, and living tree-trunks, gave it an indescribable interest and fascination. It was grand and sombre; it was awful, for to us who love mountain and forest it was a stream of death.

On the afternoon of the following day a walk to the different tributaries of Mad River revealed nothing unusual except high water and remarkably beautiful cascades, until we reached the Norway (or Slide) Brook. Here we found the brook-bed, where not protected by ledges, torn out to twice and thrice its former size. Boulders sixteen and twenty feet in diameter had been undermined and rolled into the stream. Driftwood covered the banks, while the boughs of trees twenty feet above the bed of the stream were coated with mud. It was plain to see that another slide had come down the Norway.

On Saturday the 15th a small party, including the writer, started to find the new slide, and examine it. At "Becky-town" we found that most of the old clearing had disappeared. The brook-bed was a waste of sand and rock nearly two hundred feet wide. A few rods higher up, the width of the havoc

and the amount of the *débris* was doubled. Bowlders and great stones, scattered or piled in confused masses; high banks of mud, now being cut and channelled by many streams; piles of logs and stumps; trees stripped of limbs and bark, cruelly bruised and hammered, broken asunder like matches or twisted like withes; young trees bent over and their tops buried in mud and sand; cords of driftwood in the corners, often ground to fragments finger-size, — this was the destruction before us. And this, with narrower limits and with slight variations, was the scene for the next two miles. Where the flood had flowed between walls of rock there was little to tell of its violence, save that the ledges were bare and polished. Where the hurrying mass of earth and water and forest had lodged, and for a brief space dammed the current, there were the evidences of its greatest fury and destruction: tree-trunks were hurled right and left; bowlders, piled higher than one's head, extended in long lines parallel with the current; while the hard-pan of the brook-bed, almost as solid as rock, was ploughed down five, ten, and even twenty feet to the underlying granite.

One rarely saw a tree with its roots attached, never a tree with its boughs. Most trees had been broken at least twice, — once just below the branches, once just above the roots, — and the section between, stripped of its bark, was so hammered and dented that an unbruised spot as large as one's hand was not to be found. Spruces five feet in circumference were broken like pipe-stems. Birches almost as large were twisted off, leaving their ends like basket-stuff. Great gnarly stumps partially torn asunder were frequently seen, but never a limb nor a branch; they had been broken and carried away, or ground into undistinguishable fragments. We saw cracks and crevices in the ledges wedged tight with log fragments; stones up to four inches in diameter driven their whole size into the sides of green tree-trunks; bowlders, bruised and scarred as though hammered by sledges of iron.

I have spoken of frequent heaps of mud; but in truth they are not mud. The heaps are composed of rock fragments, vegetable mould, rotten wood, moss and lichen, sand, the bark and boughs and leaves of trees, — in short, of everything in a forest, tree-trunks excepted, — and all chopped and mixed and

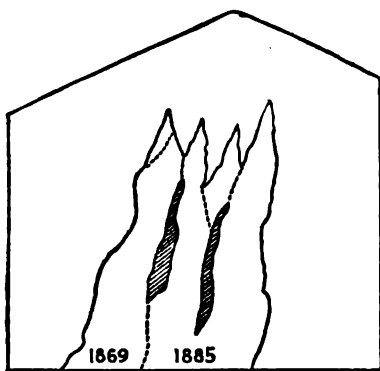


ground together into an immense salad. As one nears the foot of the mountain, these masses of slide-salad become hills twenty, thirty, and forty feet in height. We climb to the summit of one of these, then to the top of the tree-trunks piled still higher, and the new slide is suddenly before us. It is east of, and at its base united with, the slide of 1869. It is the larger. The two together have made the fair mountain-side a desert of rock. One is awe-struck and saddened at the extent of the havoc before him. He looks in silence at a destruction which grows in vastness as he gazes upon it.

A narrow strip of forest separates the two slides from near the top to two fifths of the way down; below this the two are one. The slide of 1869 is thirty feet wide at its apex; the slide of 1885 is over one hundred feet. The widest part of the old slide is equal to that of the new, but the new maintains a greater average width.

The slide of 1885, breaking into that of 1869, prevents the former from having as wide a base. From careful observa-

tion I believe the rock exposure of the slide of 1885 exceeds that of 1869 some twenty-five or thirty per cent. The slide of 1869 has one sharp apex; that of 1885 has three, the eastern being the largest. These three heads, I believe, indicate three separate landslips. The interval between them may have been only a few seconds, but I can conceive of no set of forces



THE TRIPYRAMID SLIDES.

working simultaneously that could give a single slide three apices. Another indication that the exposure of 1885 was not made by a single slide is the existence of a long and exceedingly narrow strip of forest nearly dividing the exposure from top to bottom. That the jar of one descending landslide would be likely to start another near it, is confirmed by the existence of a new slide from the head of 1869,

extending its apex some ten rods up the mountain, and adding a few rods to its western side.

After examining the great piles of forest *débris* at the foot of the exposure, and measuring some of the trees, five of us climbed over the immense deposits of slide-salad, and slowly crept up the slide of 1869 to its apex, stopping on the way to cross over to that of 1885 to make estimates and examinations. At a subsequent visit we spent less time on the way and more on the exposure, climbing also to the summit of the mountain and enjoying the magnificent view. We thought it safer, on both excursions, to make the descent on the exposure of 1869.

On the first trip we had caught sight, on reaching the opening at "Beckytown," of a long fresh scar on Tripyramid's northern peak. Our view was from the side, and but partial; yet it was plain that the storm had started two slides instead of one. From the configuration of the land we judged the northern slide must have fallen into a ravine drained by the eastern branch of Norway Brook. On reaching the mouth of this branch, however, we were surprised to find no evidence of destruction; but, on the contrary, the water of the branch was clearer than that of the main stream. With this evidence against our first judgment, I concluded the northern slide must have fallen east of the divide and gone into a western branch of Sabba'-day Brook. After our trips to the southern slide of 1885, we determined to investigate the northern one.

On Saturday, August 22, Judge J. W. Bacon, of Natick, Mass., and the writer made a field-glass study of this northern slide from the first lookout on Mt. Osceola. The position was a most admirable one, opening to our view the whole of the ravine north of Tripyramid, and revealing the surprising fact that the slide there was not one, but many; for both sides of the ravine were stripped of verdure, and showed the bed-rock in long wide scars. We now felt sure that our first judgment was correct; the slides had fallen into the ravine drained by the east branch of Norway Brook, and we determined to make it our avenue of approach. At the same time we could not understand why the mouth of the brook, two days after the slide, showed clear water and no evidence of destruction.

Monday the 24th, with two companions, we started on our exploration. Travelling the same path as a few days before, we reached the mouth of the brook, a half-mile above "Becky-town." It is a small, harmless-looking stream, and in its normal condition would not fill a water-main two feet in diameter. We started up the stream; it soon forked, and we followed the arm from the north. The mouth of the brook showed sign of neither slide nor flood; but hardly had we gone twenty rods up the narrow ravine before we began to see evidences of both. First, unusual quantities of small branches and light driftwood attracted our attention; then deep beds of sand covered the ground beyond the usual borders of the brook; then, as the ravine widened, a broad expanse of gravel and large stones covered the whole forest as far as we could see. It was a strange sight: a beautiful forest of hard-wood and spruce swept clear of all verdure, and covered from two to four feet deep with soil like that we usually find on an ocean beach, while through this the many-times-divided brook flowed in winding streams. Beyond this stretch of gravel, and about ninety rods from the mouth of the brook, our way was suddenly stopped by a huge line of tree-trunks piled in confused masses twenty to thirty feet high. Slowly climbing to the top of these, we saw at once what had saved the lower part of the brook from destruction. Before us was a wide plateau, swept clear of forest and covered with great tangled heaps of boughless trees, stumps, and driftwood. The open space is in the form of a delta, the sides being nine hundred to one thousand feet in length, with the stream entering at the apex. Here the torrent, hitherto confined within high banks, had found room to spread and spend its force laterally. Here the liquid stream of earth and rock and trees had separated and settled. Great bowlders strew the upper portion of the delta; huge heaps of twisted and broken tree-trunks cover the lower part. In the forest below it are acres of stones and gravel; still lower are spread the sand and earth, while out of the narrow but deep mouth of the brook had flowed the unburdened waters. As we gazed at the immense deposit of débris around us, we felt sure this broad delta had saved from destruction the beautiful banks of Mad River and every bridge

which spanned its wild waters. A few rods above the delta the ground rises rapidly, and the torrent has cut its way down to bed-rock, which, if I mistake not, is ossipyte, with dikes of fine-grained trap, a beautiful black background to the white cascade falling over it.

For the next mile the stream is almost the counterpart of Norway Brook, already described. The once forest-shaded and fern-framed stream is now the rock-strewn channel of a vanished torrent, sometimes one hundred feet wide, sometimes two hundred, and sometimes three hundred, lined with rootless and limbless trees, and checkered here and there with great heaps of bowlders and hills of slide-salad. We noted mud on the standing trees fifteen and twenty feet above the channel of the stream; and a fine bowlder some twenty feet in diameter, which had been undermined and rolled into the brook, was piled high with a barricade of twisted stumps and broken trees. This was evidently the remains of a temporary dam; for below this obstruction the devastation was broader, deeper, and more complete. Confined to one mile instead of three, the irresistible power of the slide is more apparent on this stream than on Slide Brook, and the black torrent we had seen at Mad River dam helped us to picture the one that had so cruelly destroyed this beautiful ravine.

About one and one-fourth miles from the mouth of the stream (which, to distinguish it from others, we have named Avalanche Brook), a climb over great piles of mud and slide-salad brought into sudden view the vast proportions of the first landslide. It was a magnificent sight. A broad band of clear bed-rock is exposed from the base almost to the summit of Tripyramid's northern peak, the lower part a clear gray granite, the upper a firm rose-red syenite. This slide, like the southern one of 1885, had descended in two channels. The western and broader one was before us. Its edges are almost parallel, and their direction a few degrees east of north. Its length is nearly one-half mile, and its apex is one thousand or twelve hundred feet above us. About twelve rods above the brook the width of this arm of the slide measures one hundred and eighty feet; above this point the width is almost uniform to the summit; below this point it turns towards the

west, and widens to over two hundred feet. The narrow line of standing trees which separates the slide almost from base to apex is about forty feet wide at the bottom, nearly one hundred feet wide one third of the way up, and comes to a point about three hundred feet below the head of the landslip.

The eastern arm of this slide is, as a whole, the narrower, but smoother, steeper, and more beautiful. Its width, twelve rods above the brook, is one hundred feet; it is much wider near the top, fifty feet wider at the base, and half-way up it is some thirty feet wider than the broad arm.

One notable thing about this slide, and one which differentiates it from all others in the same ravine, and from all others I have ever seen, is that it has a broad almost horizontal head instead of a pointed apex. Another equally striking point is that the actual exposure of rock is greater at the summit than at the base of the slide. I think that the broad head is due to the fact that the bed-rock is much less steep there than immediately below, the sudden change of angle in the slope changing the usual converging lines of breakage. The fact that the western arm of this slide does not widen as it descends, and that the width of the eastern arm rapidly decreases as it nears the bottom, is partially accounted for by the fact that in both arms the bed-rock slopes towards the centre, making the channel of the slide deeper in the middle than at the edges. This depression of the centre is greatest in the eastern or narrowest arm. Frequently the depression is not a concave hollow, but is V-shaped, and is made by the meeting of inclined and sometimes convex ledges. Twice, at least, this V-shaped trough begins abruptly, as though it had been formed by the sliding out of a long triangular prism of rock. In one case the abrupt head of the trough is spanned by a single convex stone, making a small natural arch.

Another fact which doubtless had its influence in giving this slide a striking individuality, is its steepness. It is steeper than the slide of 1869, steeper than the southern slide of 1885, and steeper than any other landslip in this ravine. The angle for the whole slide is about thirty-four degrees; the middle third is, however, considerably steeper. I am aware that the above angle is given by Mr. Sweetser to the slide of

1869,<sup>1</sup> but I am quite sure this slide is five or six degrees steeper than either slide on the south peak. The approximate size of this slide, including the narrow dividing strip of soil, is three hundred and fifty feet wide at the summit, over three hundred feet general width, and over four hundred feet wide where it turns a right angle and enters the brook. Its length on the mountain is about half a mile; its entire length to the foot of the delta, nearly two miles.

From the foot of this double slide to the head of the narrow (east and west) ravine into which it falls, is a short half-mile. A horizontal section of the ravine would give the letter V; a perpendicular section would give the same letter. Next to the double slide, the most striking landslip in this Ravine of Avalanches is that which went out of the ravine itself, and laid bare its beautiful gray bed-rock from end to end. We climbed up its steep incline on a floor as clean as that of a marble hall, and the clear waters of the little brook that slipped down its smooth surface made it shine as though polished for our reception. The southern wall of the ravine is the sloping bed-rock of Tripyramid; the northern wall is built of glacial drift, or the steep granitic slopes of the adjoining spur. In both cases the retreating slide had washed them clean for twenty to forty-five feet above the bottom of the V. The floor of the ravine, like that of most of the slides falling into it, was a bright, compact gray granite, comparatively free from dikes, quartz, seams, or geodic cavities. The only exception to this was near the head of the ravine, where we found a narrow seam as soft as dough, probably a decomposed feldspathic rock.

Eight or ten rods above the double slide a small landslip fell into the ravine from the north. It is triangular in shape, with nearly equal sides of about three hundred feet, but possesses no points of special interest. A few rods higher up, the ravine received another slide from the south, — a broad, shallow, triangular landslip, with a base of about four hundred feet and sides somewhat longer. It is not sufficiently steep to have cleared the bed-rock of soil, and has few if any boulders. During the next forty rods the ravine rises rapidly,

<sup>1</sup> Osgood's Guide to the White Mountains, p. 328.

and received five different landslides from the north. All are triangular; none of them are wider than two hundred feet base, with a length usually less; all are quite steep, and most of them leave the bed-rock clean, and will be full of interest to the geologist. The rock exposed is the same as that in the ravine, — bright gray granite. Near its head the ravine received still another landslide from the steep slopes of Tripyramid. It is shaped like the letter A. Its base is one of the broadest in the ravine, but its length does not exceed sixty-five rods. A climb to its apex revealed a multitude of deer tracks and a fine view.

In connection with this northern peak of Tripyramid, I have mentioned eight or nine slides. They are all there, and yet they are so connected that it might be well to consider them as parts of one vast avalanche. The ravine in shape is not unlike the hull of a ship; its glistening floor answers to the keel, and the white walls of granitic rock which come down to join it from north and south may easily be counted its ribs. In the extent of its exposure of bed-rock this series of slides exceeds the combined exposures of the great slide of 1869, and the greater one of 1885 on the south peak; and I am much mistaken if the whole region of the White Hills has anything worthy to be compared with it.

On a subsequent visit to the Ravine of Avalanches I climbed to the head of the ravine, and with a few companions took a south-southwest course through the woods to the great slide of the series. Three of the party were ladies, but they had all climbed other slides; so when we struck the double slide we started at once diagonally across the bare rock for the apex, about seven hundred feet above. On reaching the middle of the exposure we realized, as we had not from below, its extreme steepness and smoothness. A loose stone started by one of the party found no place of lodgment, but with constantly increasing momentum bounded down the half-mile of slide, and with fearful force dashed itself into fragments on the boulders at the bottom. Unlike the slides on the southern peak, the rock here is not friable; and while there was less danger from loose boulders, there were also fewer cracks and crevices to cling to. It is needless to say that we did not walk

up the slide ; we crawled slowly, picking our way with care and clinging with fingers and toes. Several hundred feet of this kind of work gave us so excellent an idea of the exposure that we were all willing to leave it for the woods.

From the apex, which is about eighty rods below the summit of Tripyramid, is to be seen a magnificent semi-circle of mountains from Moosilauke to Carter Dome, including the long stretch of the Tecumseh-Welch Range, the impressive mass of Osceola, the broad peak of Hancock, the densely wooded slopes of Carrigain, and behind them the noble peaks of the Franconia group, and the towering summits of the Presidential Range. I never saw Carrigain to better advantage, or the Washington Range when it appeared more impressive.

We descended through the woods on the western edge of the slide, finding the footing secure and the forest comparatively free from underbrush. The broad arm of the slide has since been ascended and descended over the bare ledges ; but the two young men who first accomplished it had to slide down most of the way in a sitting posture, to the damage of their hands and the utter destruction of shoes and trousers. A New York gentleman who made the ascent on the same day, lost his footing near the top and came near rolling down the slide. He sprang for his life and saved it, but was strained internally, and confined to his bed for many days.

During two visits to the southern slides and four trips to those falling into the Ravine of the Avalanches, I have carefully examined the exposures with reference to the question, "What causes a landslide?" Professor Hitchcock, State Geologist of New Hampshire, says, speaking of another notable slide of the past season : —

"The conditions giving rise to this slide upon Cherry Mountain seem to have been the presence of gravelly granite *débris* upon smooth ledges having a jointed structure pointing downward. This *débris*, thoroughly saturated by water, became plastic and moved downward just as soon as the blocks of *syenite* and *porphyry* started on their course, breaking off trees, and thus increasing the moving mass every rod of the way, till the lessened slope caused the viscous flood to stop."<sup>1</sup>

<sup>1</sup> Science, vol. vi. p. 87.



These words are particularly applicable to the slide of 1869 and to the southern slide of 1885. These are side by side, and in the slope of their ledges and their much-jointed structure possess nearly the same conditions. On the northern slides one finds the ledges less friable, smoother, and more steeply inclined. One of the secondary factors in producing slides, and one which it seems to me has received but little attention, is the preparatory work done by underground streams. All mountain climbers are familiar with the fact that often a spring, and sometimes a brook of some little size, will be heard running under ground for a long distance before it comes to the surface. These streams must make channels between the soil and the rock,—in wet seasons large ones,—and surface water breaking into such underground channels must multiply and enlarge them. The southern slide of 1885 has laid bare one such spring in each of its arms, and several have been uncovered by the northern slides.

In a true sense of the word, slides are a growth. I have noticed on steep mountains some places where a few trees have slipped a yard or two and stopped, leaving the bed-rock exposed. Mr. G. T. Crawford, who has surveyed timber lands in these forests for thirteen years, informs me that he has seen such slips extending for a width of several rods. Judge Bacon, who has spent fourteen summers on the mountains of the Osceola group, corroborates the testimony of Mr. Crawford, and adds that several years ago he descended the slopes of Tripyramid over the very ground swept by the southern slide of 1885, and that he then observed several such crevices or incipient landslips.

One can easily understand how a long crevasse extending across a steep mountain-side, receiving the surface streams of every storm, should gradually tunnel and undermine the forest, and, with other underground streams, prepare the way for some extraordinary rainfall to reach the bed-rock and start the whole mass of saturated earth down the incline.

In confirmation of the above I would state that in viewing the Ravine of Avalanches from Mt. Osceola, I noticed that a small slide falling into the head of the ravine from the north had a lighter appearance than the others,—a fact afterwards

forgotten. On my last visit I was again in a position to notice the lighter shade of this exposure. Climbing upon the slide, I was surprised to find the granite had been bleached by exposure. A hasty glance showed me that trees standing on its edge were dead. The slide was an old one. An examination of bushes growing in soil left on the rock indicated that the slide was from twelve to fifteen months old. But why had not the little brook accumulating behind this dam of soft earth pushed it down the ravine a year ago? A line of moss before unnoted, in the centre of an exposure on the opposite side of the ravine answered, "I am the original brook-bed, and I enter the ravine just below the old landslip." Here then was the beginning of this series of grand slides. For over a year the bed-rock had been exposed at the head of the ravine, for over a year the water that fell above this slide had been making underground channels between ledge and soil, so that when the great rains of August came the earth was ready to be floated down on the flood.

Another question I have asked myself is, "Do slides start at the top or at the bottom?" And the answer my study of Tripyramid prompts me to make is, "Rarely or never at the apex, seldom at the very bottom, but generally at some place between these points." I examined the southern slide of 1885 with much care in reference to this question. The long island of forest which partially separates the two arms of this landslip makes it highly probable that the point of starting was above this division. In support of this is the additional fact that above the island the edges of the slide have the appearance of having had the earth pulled out from them, while below the island the edges are more or less pushed in and covered with débris. Moreover, just above the island there is a section of unusually steep and smooth edge; this I believe to be the starting-point of the slide. The same section of steep and smooth ledge crosses the slide of 1869 about midway between its base and apex.

In the largest of the northern slides of 1885 the bed-rock slopes from the edges towards the centre of the slide. This is true of both arms of the landslip, and gives the edges of the slides the appearance of having had the earth pulled out

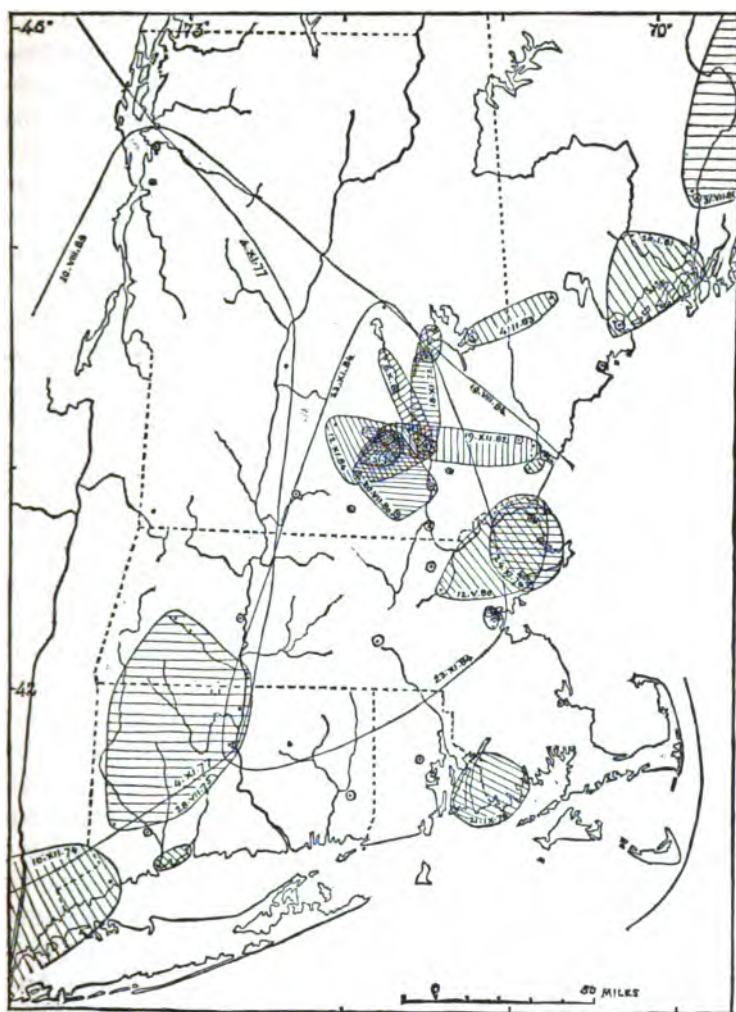
towards the centre. The division between the arms of this slide is carried to within a short distance of its head. This fact, and the additional one that the upper section where the slide is undivided is exceedingly steep, would indicate that this slide also began its career well up the slope. My present opinion is that each separate apex of a slide indicates a separate landslide. The different movements were probably but a few seconds apart, the jar of one starting another. I cannot, however, conceive of one great slide starting simultaneously from several different heads, nor of the downward movement of one great mass separating into several points at the top. I do not mean to dogmatize on this, or on any other question connected with landslips; I only give impressions and opinions. I hope, however, that all who are interested in this subject, or that of geology, will not fail to find their way to the wonderful exposures on the slopes of Tripynamid.

---

### Earthquakes in New England.

By W. M. DAVIS.

THE recent occurrence of two earthquakes in southern New Hampshire on Jan. 5 and 17, 1886, emphasizes the need of our taking some steps towards their systematic study, in order to learn where they are most frequent, and to determine, if possible, whether they are in any way related to the geological structure of our old mountain system. The accompanying map will serve to show that earthquakes are frequent enough in New England to be worthy of investigation: it is constructed from the "Notes on American Earthquakes" compiled by Professor Rockwood chiefly from newspaper reports, and represents all the shocks recorded within the area of the map from 1872 to 1884, inclusive. A dot enclosed by a circle indicates a report from one place only. The various small irregular ovals enclose shaded areas over which shocks were reported by several observers, the date being marked at the margin by the

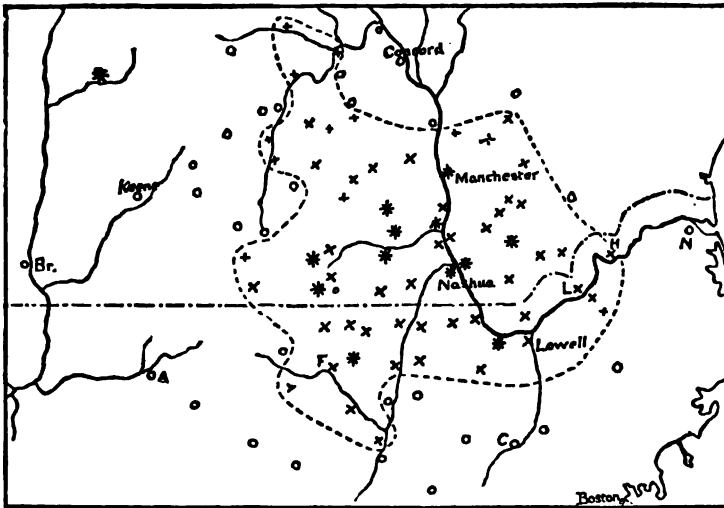


EARTHQUAKES IN NEW ENGLAND, 1872-1884.

day, month, and year; the boundaries are necessarily only faint indication of the areas actually disturbed, as will appear below. The much larger areas of three more violent shocks are simply enclosed by lines. From this it appears that southern New Hampshire is the most frequently disturbed region, and that Contoocook and Concord report more shocks than any other places. But a map based on reports as vague, irregular, and

unsystematic as those cut from newspapers is open to subjective errors of considerable value. The relatively numerous dots about Boston probably mean only numerous observers; for it is very improbable that centres of earthquake activity and of New England population should coincide so nicely. The relatively high activity about Contoocook is probably also in part subjective, arising from the greater watchfulness and regularity of the reporter there than elsewhere. An idea of the true distribution of earthquakes cannot be gained until observations are more uniformly made and gathered: the map here presented has its chief value in pointing out the region most worthy of study.

The shock of January 5 was felt at the village of Merrimack and in a few adjoining towns between Manchester and Nashua: it made an audible sound, and set a few dishes and stoves rattling. The shock of January 17, about 5.15 p. m., was somewhat stronger, and was felt over a much wider area in southern New Hampshire and northern Massachusetts. By means of a pretty active correspondence, positive and negative reports have been gathered from over one hundred and forty persons at ninety-eight different points; at sixty-four the shock was perceived, and at the remainder nothing was learned about it. These reports are charted on the accompanying sketch map: the eight-rayed stars represent points where the sound was very distinct, and where loose objects were audibly shaken; the oblique crosses represent an intermediate intensity; the small vertical crosses mark the points where the effect was only faintly perceived; and the little circles show the towns whence inquiry brought only a negative reply. In collecting these data, effective assistance has been received from Mr. C. H. Webster, of Nashua, who furnished fifty reports, as well as from S. D. Lord, Esq., of Manchester; Mr. C. H. Howe, of Groton; and Mr. C. L. Whittle, of Hillsboro' Bridge. The sound of the shock was frequently described as resembling that made by a heavy wagon on a frozen road, or by a snow-slide from a house roof. The area shaken covers nearly two thousand square miles, and is central a little north-west of Nashua; the irregularity of the boundary is probably due in good part to inequality of observation: the lone star in



THE NASHUA EARTHQUAKES OF JAN. 17, 1886.

western New Hampshire represents a trustworthy circumstantial report, agreeing closely in time and character with those about Nashua, although separated from the main area of disturbance by several consistent negative reports.

One of the most promising results of this inquiry is that if this earthquake were described on the same scale of accuracy as that on which the New England map is based, it would appear only at Nashua and Manchester; for the newspaper reports mention it only from those cities. Evidently, therefore, the map does not at all adequately represent our seismic activity, and the prompt gathering of records from many correspondents promises to yield results fully worthy of our attention. It is to be hoped that the United States Geological Survey will foster this inquiry, and, by promoting accuracy and uniformity among observers well distributed all over the country, will accumulate data that will be both complete and comparable. Our Club may well take part in the work, and may render valued assistance by securing observers in many towns, who shall send prompt report to us of all shocks they may feel. Such reports should make mention of the time of the shock; its intensity, as measured by faint (barely perceptible), light (noticed by a number of persons), distinct (shaking

loose objects), and so on; and any further notes they can make. It should be understood that negative reports, from adjacent towns where the shock was *not* felt, have a decided value in such investigation, and should always be gathered with care.

CAMBRIDGE, MASS., Feb. 16, 1886.

---

### **A Day on Flume Mountain and a Night in the Wilderness.**

BY J. RAYNER EDMANDS.

Read at the Flume House Field Meeting, July, 1886.

IN starting for an active vacation among these hills, there are a number of little things which should enter one's baggage, but which might easily be forgotten because they are not used at home. For example, who starts "down town" or "out shopping" armed with a drinking-cup? It is well to keep these things all together at home between trips, in order that none may be left behind; but woe be to the man who packs so hurriedly as to forget all of them! In this condition your humble servant found himself, a few weeks ago, at this house. Flume Mountain was to be ascended, and the top prepared for observation. Accordingly, an axe-man was needed. Our trusty man, Sargent, had been engaged by a friend for the northern part of the same range, but there was available a man who was ready to undertake to conduct parties through these woods; and so, contrary to rule, the forest was entered without a compass.

After pleasant good-byes at the Flume House, at a quarter before eight we took a leisurely pace to and through the Flume,—so changed in its second childhood,—paused for reminiscences of what it had been in its prime, and continued on the gravel and rocks of the brook above. There was plenty of time for the programme as laid out; and so no objection was made to the axe-man's first request for a five minutes'

rest, nor did we hurry away from the base of the slide which had so changed the Flume. Flume Brook, which had been curving somewhat to the left as we ascended, here bends a little the other way, and a small brook comes in at the left, forming a fork. The bed of this little brook and a second channel beside it are now deeply cut into the soil, with a narrow ridge between, perhaps thirty rods long, on which the trees still stand. Imagine the sensations of a man, had he been on this narrow island of trees at the frightful time when the slide came down! Could he have kept his footing, his bearing, his wits, or his very breath? From this point we took to the woods on the right until we reached the mass of gravel lying below the broad slide that is so conspicuous on Flume Mountain as seen from this house. We now ascended an avenue from one to two hundred feet broad, of gravel and bowlders, which, as we afterwards saw, has a narrow companion on the right, the broad avenue forming a bow for which the narrow would be the string. Above the upper limit of the trees, on the narrow belt that separates these avenues, we travelled on the gravel ridge which still divides the two gullies, and thus reached the steep, outcropping ledges. Frequent rests for breath are here necessary; but how the view broadens with each short pull! There is more or less loose stuff intermingled with the ledges here, and still farther up is reached an area of very treacherous ledge. Once I had to spring from one footing to the next while holding on to a certain piece of the ledge. It is sometimes pleasant to be met half-way in any movement; but I should not have chosen the ready response which this rock gave, as it moved ponderously to the spot from which my foot had just been hurried away, and then bounded down the ledges with such a noise that I had to wait for it to stop before assuring my companion that all was well. At about this height a sort of V of trees makes down, the portion on the right of it soon narrowing out, while the main slide, now also narrow, is found on the left. At this V floats the cloth left by Mr. Bishop when he and Mr. Langton visited the slide. Still higher are very steep banks of fine gravel, stones, and small bowlders. After reaching the middle



of one of these, the whole mass showed a tendency to move slowly down, like tar. It was necessary to lie on the back and dig one heel into the gravel, to keep one's position while digging a similar socket for the other heel. Interchanging heels then freed the foot on the advancing side to make another socket. Thus, crab-fashion, the edge of the bank was reached and the ascent resumed. As there seemed to be nothing further to see by keeping upon the slide, we took an easier and safer course in the woods on the left; but I made a little circuit so as to sit at the very top of the slide. Imagination is tempted to picture this point as the origin of the slide, and to observe how little things lead to great ones. But did you never start a Liliputian slide by poking a sand-bank with a stick? Do you not remember that, beside the diminutive havoc below, the sand broke away and followed from above? My seat was *not* probably the source of the slide, all trace of which was doubtless removed by the avalanche of earth and rock which swept down upon it as soon as the support was removed.

A very short climb from the top of the slide brings one to the crest south of, but near, the summit of Flume Mountain. Following this crest over two of the knobs, helped by a hedgehog trail, we reached the highest point of the mountain. The slope eastward from the crest bears fair-sized trees, but the westward slope is steep and scrubby. The gnarled growth looks as if it had been continually blown up hill by prevailing westerly winds.

Of the view from Flume Mountain I can say nothing, thanks to rain and cloud. The time was spent directing the clearing of the summit, to fit it for occupation with a theodolite.

Mention has been made of a friend. He was upon the northern part of the range, but his lunch was in my basket. So I started early in the afternoon to meet him on Mt. Liberty, lying northeasterly from Flume Mountain. It was admitted that if one descended the ridge to the lowest point between Liberty and Flume Mountains, and then desired to go direct to the Flume House, he must descend to the left. The axe-man, who was to stay and finish his work on Flume,

had added the caution that if I went up Liberty and returned upon my course, it would be necessary to descend from the ridge toward the *right* instead of the left. With advice whose correctness was so indisputable, with one lunch eaten and another in my basket, but without a compass, I started northward down the ridge, light of heart but fairly well loaded with instrument, lunch-basket, and wet clothes. The crest of the ridge was kept; but time went on very mysteriously, without any ascending toward the summit of Liberty. Deciding that I should be too late to catch and feed the hungry, I descended on the left of the ridge, in order to reach the Flume House as soon as possible. The fact is that the ridge broadens out and forks, so that I was descending into a ravine between the forks, and lying behind Mt. Liberty. The water in this ravine runs a dozen miles through the wilderness on its way to civilized parts near North Woodstock. My first shock was on reaching the water, and finding it not a handful of water running from me, but a goodly stream flowing from left to right. Then the fact that I had travelled so long on the ridge without meeting any ascent toward Liberty became significant; and the question arose, How was I to gain *my* liberty from the imprisonment of these woods and ridges?

With a compass, or with a clear air which would allow glimpses of surrounding summits, it would have been a simple matter to follow up the stream, cross the mountain ridge between me and the Flume House, and descend to the road before dark. Without such means, the only safe way to attempt it would have been to retrace my steps to the summit of Flume Mountain, and then descend with greater care and more knowledge of the lay of the land. For this course there were not hours enough of daylight left, and this was not the sort of night to spend near those steep, slide-inviting slopes. The other and more prudent way was to keep on down stream, and follow successively the Lincoln Branch, the Franconia Branch, and the East Branch of the Pemigewasset to Pollard's, whence a half-dozen miles of open road would lead to the Flume House. To reach Pollard's before dark was impossible; to get out of the woods before daylight was improbable; but I tore on with a vigor born only of thoughts of anxious

ones at the hotel, and as the hours flew by, encouraged hopeful reflections about the probability of bark shelters left by some of the fishing-parties which frequent the flatter regions toward which I was hurrying with all my might. The stream soon became too large to follow without wading, and the water was too cold to make wading prudent, as I found by taking an involuntary seat in mid-stream. The banks sloped toward the stream with inconvenient steepness for a long distance, but finally the country flattened out, the stream merely occupying a gorge. Then I took the more level walking above the bank on the right of the stream, and soon after struck a welcome trail,<sup>1</sup> partly by accident, but partly by beating to and from the bank in hope of finding one. At length this trail descended a little slope overlooking a flat near a bend in the stream. On this flat stood a couple of bark shelters. But more! A murkiness in the air above, a little thread of smoke below, a camp-fire, and some forlorn-looking pleasure-seekers moving about in rubber coats preparing camp for the night. On inquiry, I found myself on the Franconia Branch, a quarter of a mile from the East Branch of the Pemigewasset. It proved to be still eight miles to Pollard's, six miles to the point where the broad logging-road of the East Branch begins to follow the northern bank of the river, and four miles to the burnt place, so called,—a point beyond which the path might possibly be followed in the dark. It was after half-past six. To reach the burnt place seemed hopeless; but I pressed ahead before they could advise stopping. The minutes flew, the daylight weakened, my pace slackened, the trail grew blind. I could not get out in time to relieve anxiety at the hotel. So I turned back, and again found the camp, with its hospitable inmates conscience-stricken at having let me go.

If you wish to appreciate a fire, and a cup of hot coffee and camp-fare generally, first take a ducking. Let it suffice to say that after wringing out his clothes your adventurer had a warm night of it, left camp a little after half-past three o'clock in the morning, after a good breakfast, took a few glasses of milk at Pollard's at a quarter-past six, and reached

<sup>1</sup> The Black Pond Trail.

the Flume House shortly after eight o'clock, in time for another breakfast.

Meanwhile, how did all this look at the hotel? A man accustomed to find his way about mountain ridges and through woods had failed to appear. But stop! The day and the night mentioned in our title are over.

---

### Middlesex Fells.

BY ROSEWELL B. LAWRENCE.

MANY inquiries have been made during the last few years concerning maps of the Middlesex Fells. A good map was published by the late Hon. Elizur Wright, in June, 1883, but it does not show the numerous wood-roads which give access to the many points of interest. This want has led to the preparation of a map published in connection with this number of APPALACHIA.

In its compilation valuable assistance was obtained from Mr. Wright's blue map, Prof. H. F. Walling's map of Medford (1855), Mr. G. M. Hopkins' maps of Stoneham (1874) and Melrose (1874), a plan of the Winchester reservoirs, drawn by Mr. Percy M. Blake, and the maps of the various municipalities in Beers' Atlas of Middlesex County (1875). These maps, however, afforded but little assistance in locating the wood-roads, foot-paths, hills, brooks, and swamps. To accomplish this part of the work the writer has traversed every wood-road and foot-path — many of them several times — and has climbed nearly every hill. Although accuracy is not claimed, no scientific observations having been taken, yet it is hoped that the results of personal exploration, published in this map, will be useful to the lover of Middlesex Fells, and will lead many strangers to form an intimate acquaintance with the numerous attractions of that delightful region.<sup>1</sup>

<sup>1</sup> A request is here made that any one who discovers errors or omissions will kindly send the information to the writer, in order that it may be incorporated in a subsequent map, should a second edition be deemed advisable.

The location and character of Middlesex Fells are well described by Mr. Sylvester Baxter : —

“Something like five miles northerly from Boston lies a great tract of country, all stony hills and table-lands, almost uninhabited, and of wonderful picturesqueness, and wild, rugged beauty. It is within the limits of the towns of Malden [now a city], Medford [Melrose], Stoneham, and Winchester; and its heart is that most beautiful of Boston's suburban lakes, Spot Pond, which lies high up among the hills. The limits of this region are defined with great clearness, especially on the south and east, a line of steep hills and ledges rising abruptly from the broad plain that borders the Mystic River, almost as level as a floor, and forming its southern boundary, while on the east the ledges start with still greater steepness out of the long valley of meadow-land through which the Boston and Maine Railroad passes. . . . Its western margin is formed by the valley through which run the Lowell Railroad and its Stoneham branch, and its northern by the houses and fields of Stoneham. . . . The nature of this region cannot be better characterized than by the application of the old Saxon designation *fells*, — a common enough word in England, meaning a tract of wild stone hills, corresponding to the German word *felsen*.”<sup>1</sup>

During the past few years efforts have been made by Mr. Wright and others to secure the preservation of this region as a Natural Park or Forest Preserve. The territory embraces about 4,000 acres, including 500 of water reservoirs. The owners number 150, and the assessed valuation is between \$300,000 and \$350,000, including buildings valued at about \$70,000. The limits, as marked upon the map, are arbitrary, having been drawn by Mr. Wright and others so as to include the water-sheds of the reservoirs, the chief hills, and all the wooded and rocky land lying between the settled portions of the five towns. Much of the region is now covered by brush; but there are many fine groves of pine and hemlock, and hundreds of acres covered with oak, birch, maple, hickory, cedar, etc. The whole region is well adapted to the growth of white pine.

A “Chronological Account of the Middlesex Fells Movement” was given in the “Boston Evening Transcript,” Nov.

<sup>1</sup> Boston Herald Supplement, Dec. 6, 1879. See also Transcript, Nov. 15, 1880, answer to query 3,156.

13, 1880. In this account we find mention of Mr. Wilson Flagg's article entitled "A Forest Preserve: A Proposition to State and City Governments." Mr. Flagg alluded to the wild region extending from Stoneham to Salem as a good site for the location of one or more of these preserves.<sup>1</sup> In 1869 Mr. Wright published a pamphlet entitled "Mt. Andrew Park," in which he recommended that the Fells region, then known as "The Five-Mile Wood," be converted into a park. He advised the preservation of the forest upon the hills, and the establishment of Schools of Natural History in connection with it. In the last chapter of "The Woods and Byways of New England," published in 1872, Mr. Flagg recommended that "The Five-Mile Wood" be selected as a site for a "Forest Conservatory," and in 1876 an unsuccessful attempt was made by Mr. Flagg and others before the Massachusetts General Court to secure legislation favoring this project. In 1879-80 appeared Mr. Baxter's article, and three open letters by Mr. Flagg to Col. T. W. Higginson.<sup>2</sup>

The Middlesex Fells Association was organized in the early part of 1880, with Mr. Wright as President. At one of its meetings two interesting communications were presented,—a statement by Mr. Flagg showing the public the objects of the Association, and a letter from Mr. Frederick Law Olmstead giving his advice on the Fells project.<sup>3</sup> Under the auspices of the Association a mass meeting was held in the Medford Town Hall, Jan. 26, 1881, the principal speakers being Governor Long, Prof. B. G. Northrop of Connecticut, Col. T. W. Higginson, Hon. E. S. Converse, John Owen, and Elizur Wright.<sup>4</sup> The most important work accomplished was the passage by the Legislature of the Public Domain Act, chapter 255 of the Acts of 1882, "An Act authorizing towns and cities to provide for the preservation and reproduction of Forests." This act empowers a town or city to take or purchase land for the preservation and culture of forest trees, or for the preservation of the water-supply, to

<sup>1</sup> Charles M. Hovey's Magazine of Horticulture, Jan., 1856.

<sup>2</sup> Transcript, Dec. 31, 1879, Jan. 13, 23, 1880; see also Dec. 11, 18, 30, 1880.

<sup>3</sup> Herald, Nov. 14, 1880.

<sup>4</sup> Transcript, Jan. 27, 1881.

make appropriations in money for such taking or purchase, and to receive donations in land or money. The title of such land is to vest in the Commonwealth, and be held in perpetuity for the benefit of the town or city in which it is situated. The State Board of Agriculture, acting as a Board of Forestry, is to have the management of all such public domains, and to make regulations for the preservation of timber and the planting and cultivating of trees; it may also appoint keepers and lease buildings. The income from leases and the sale of products is to be applied to the management of the domain, the surplus in any year being paid to the city or town in which the domain is situated. No land can be taken or purchased, or liability incurred under this act, until an appropriation sufficient to cover the estimated expense shall have been made in a town by a vote of two thirds of the legal voters present and voting; or in a city, by a vote of two thirds of each branch of the City Council. To defray the expenses, bonds may be issued, denominated on the face "Public Domain Loan." These are the leading features of the Act.

To encourage favorable action by the five municipalities, a subscription was started, and a Board of Trusters formed to receive and hold "conditional obligations" which were to be collected and paid to the municipalities, when by their concurrent votes the title of the real estate should vest in the Commonwealth. Although no canvass was made, about \$15,000 was subscribed. The passage of the new Forest Law was celebrated June 17, 1882, on Bear Hill, by a meeting of the Fells Association, the Essex and Middlesex Institutes, and other friends of the project. Among the speakers were Hon. George B. Loring and Hon. Daniel Needham.<sup>1</sup> The Medford Public Domain Club was organized Dec. 17, 1884, to enlist the active co-operation of Medford citizens; and the meeting was addressed by Rev. Edward Everett Hale and Mr. Wright.<sup>2</sup> Many other meetings have been held, in public halls and at various points in the Fells.

On Nov. 21, 1885, the Hon. Elizur Wright died suddenly at his residence in Medford. He was the originator and chief

<sup>1</sup> Massachusetts Ploughman, June 24, 1882.

<sup>2</sup> Globe, Dec. 18, 1884.

supporter of the Middlesex Fells project, and his life was probably sacrificed by overwork in endeavoring to arouse public interest in its behalf. He was a Life Member of the Appalachian Mountain Club, and a frequent attendant upon its meetings and excursions. Jan. 9, 1884, he read a paper on the "Sanitary Effect of Forests."<sup>1</sup> An appropriate eulogy, which I am permitted to quote, was contained in the address of President T. W. Higginson before the Club, Jan. 13, 1886:—

"We miss from among us the face of that devoted friend of all outdoor explorations, Elizur Wright. I have known him almost all my life: first, as the fearless ally, and at times the equally fearless critic, of William Lloyd Garrison; then as the translator of La Fontaine's Fables, — a task for which he seemed fitted by something French in his temperament, a certain mixture of fire and *bonhomie*, which lasted to the end of his days; then as a zealous petitioner before the legislature to remove the lingering disabilities of atheists; and then as the eager, hopeful, patient, unconquerable advocate of the scheme for setting apart the Middlesex Fells as a forest park. I served with him for a time on a committee for that seemingly hopeless object, and shall never forget the inexhaustible faith with which he urged it. In his presence it was almost impossible not to believe in its speedy success; all obstacles seemed little before his sanguine confidence, and each scattering donation of a dollar or two filled him with renewed faith, although it was plain that tens of thousands of dollars must be forthcoming to accomplish the end. Scarcely any one was ever present at these committee meetings except the three old men in whom the whole enterprise appeared to centre, — Wilson Flagg, John Owen, and Elizur Wright. They were all of patriarchal aspect; and as they sat leaning toward each other, with long gray locks and gray beards flowing, I always felt as if I were admitted to some weird council of

<sup>1</sup> Among the numerous articles written by Mr. Wright, the following may be mentioned in addition to those noticed in the text: The Park Question; The Park of the Future; Middlesex Fells (several papers); The Forests; Middlesex Fells, Boulevards across Mystic Valley; Middlesex Fells, Suburban Park between Medford and Stoneham; Our Water Supply, address in the Town Hall, Malden, March 31, 1881; Oh for a Worthy Palm (poetry); The Legend of Cheese Rock (poetry); The Voice of a Tree from the Middlesex Fells, Transcript, Oct. 10, 1883; The Public Domain, — the Atmosphere of Heaven the Atmosphere of the People; Forest Culture from a Sanitary Point of View; The Massachusetts Law; Answers to L., Medford Mercury, Jan. 9, Oct. 30, 1885; "Fas est ab hoste doceri," Medford Mercury, Nov. 6, 1885.



old Greek wood-gods, displaced and belated, not yet quite convinced that Pan was dead, and planning together to save the last remnants of the forests they loved."

The principal attraction of Middlesex Fells is Spot Pond, a beautiful sheet of water with several pretty islands and many rocky and wooded points. The name of the pond, interesting on account of its historic origin, is explained by the following quotation from Governor Winthrop's Diary :—

"February 7, 1631 (O. S.). The governour, Mr. Nowell, Mr. Eliot and others, went over Mistick River at Medford, and going N. and by E. among the rocks about two or three miles, they came to a very great pond, having in the midst an island of about one acre, and very thick with trees of pine and beech ; and the pond had divers small rocks standing up here and there in it, which they thereupon called Spot Pond. They went all about it upon the ice."<sup>1</sup>

The elevation of this pond above the sea is about 150 feet, the greatest depth 32 feet, the area 296 acres, and the area of the water-shed about 1,100 acres. The water, which is exceptionally pure, is the source of water-supply for the city of Malden and the towns of Medford and Melrose. The small brick and stone buildings on the south and east shores belong to the water-works.

Boats can be hired to row to the islands, and paths may be found leading to the most attractive spots along the shores. There are several good places to rest or lunch. On the south side of the pond, near Forest Street, is a pine grove, a part of which was formerly used as a picnic-ground ; the view is very pretty. On the shore, a short distance farther east, is a picturesque rock jutting into the water. This spot can be reached by following the shore from Forest Street, or by taking a narrow sylvan road which leaves Forest Street at a point farther south. Between the Medford water-works and Wyoming Street is a high point with pines and hemlocks, commanding one of the finest views on the pond. This place can be found by following foot-paths from Wyoming Street and

<sup>1</sup> Winthrop's *New England*, vol. i. p. 6. See also *Mt. Andrew Park*, by Mr. Wright.

the Medford gate-house. On the southeast side, along Wyoming Street are several stone houses which command good views. Pretty views can also be enjoyed from Pond Street, where it runs along by the water. On the west side of the pond is another beautiful spot, a rocky, wooded promontory, commanding a view of the whole pond, including the interesting features on the south and east sides. To reach this point, take the path next south of the road which leads to the old ice-house, invisible from Main Street.

From Spot Pond, Governor Winthrop and his party went to what is now called Bear Hill. This is the highest elevation in the Fells, being about 370 feet above sea-level, and is distant from the State House exactly  $7\frac{1}{4}$  miles.<sup>1</sup> I am indebted to Professor Charles E. Fay for the following description of the view from Bear Hill: —

“The view from Bear Hill is interesting, first of all, for what lies near at hand. From no point, perhaps, can one secure a more comprehensive view of the Middlesex Fells; and it is over these scantily wooded knolls, or between them, that one catches glimpses of Boston and its neighbors. How subordinate the part which the city is forced to play in this scene! and then to think that there is spare money enough just over there, if it could only be got at, to ransom all this fair wild, and make it a free park forever!

“The horizon from south to west is set with familiar eminences, — the Blue Hill Range, the hills of Brookline and Newton, with distant Pegan over Belmont, and then the heights of Arlington, Lexington, and Woburn. Then the sky-line suddenly retreats, and for sixty degrees we have an almost continuous line of distant mountains. How they gleam these March days under their snowy mantles! First the ‘whaleback’ of Wachusett, nearly due west; next, after two or three considerable hills, Watatic rises in a pronounced cone; then comes the monarch of them all, the grand Monadnock. The lower swell of Kidder Mountain follows, and then a fine mountain-mass, rivalling Monadnock itself as seen from here, yet in reality far less grand. It consists of two high peaks, some distance apart, but joined by a lofty ridge. The first is Temple Mountain, the other Pack Monadnock. Yet more to the right is another long mountain rising into something of a peak at its eastern end, — the Lyndeborough Range. A trifle farther to the

<sup>1</sup> U. S. Geological Survey, 1885.

right and still more distant, one sees Crotchet Mountain, in Frances-town, rising above an intervening hill. Nothing of note follows until Joe English Hill, lifting its bulk out of the low horizon, asserts itself with much more assurance than the higher Uncanoonuc, whose upper portions only are seen farther to the eastward, overtopping a much nearer ridge. Nearly as far to the right of the Eastern Uncanoonuc as Joe English is to its left, about midway between the former and that prominent hill in the middle ground which ranges in line with two ponds (Fox Hill, in Billerica), rises a high and very distant summit, which can hardly be other than the southern Kearsarge. A few degrees west of north, where the horizon again recedes, the eye greets a mountain seldom noted in the list of those visible from our suburban hills, — probably Pawtuckaway, a coast-survey station in Rockingham County (N. H.). About as far to the east of north are the hills of Andover, the grassy slopes of Holt's most prominent. Over other gently swelling hills of Essex County the view ranges, until, summoning courage to pass the great rampart of masonry that crowns the summit of Asylum Hill in Danvers, it comes to enjoy the glimpses of the sea."

On the north slope are cedars, in the shade of which one can rest while enjoying the view of the distant mountains. Here the Governor's party lunched. "This place they called Cheese Rock, because, when they went to eat something, they had only cheese (the governour's man forgetting, for haste, to put up some bread)." <sup>1</sup> It is somewhat uncertain where this rock is located; but according to the most generally accepted opinion, it is the precipitous ledge which faces the north. The hill may be approached by cart-paths leading from Main and Marble Streets to the foot of the steep northern slope; also by a path on the east side, ascending gradually from Main Street to the open table-land a short distance south of the summit.

Taylor Mountain might well be called the southern end of Bear Hill, being part of the same mass. From this so-called mountain we have a charming bit of scenery. Below the ragged cliffs on the southwest side is the long narrow basin of the Winchester reservoir, curving among the hills. One does not suspect that this beautiful sheet of water is the work

<sup>1</sup> Winthrop's New England, vol. i. p. 6.

of man, until he spies the gate-house at the northwest end. The dam cannot be seen from the upper part of the reservoir, and is hardly noticeable from Taylor Mountain. The pond is seven eighths of a mile in length, 26 feet in depth, and its elevation is about 150 feet.<sup>1</sup> The area is 60 acres, and the area of the water-shed 460. The view from Taylor Mountain also includes Spot Pond, Turkey Swamp, the numerous hills of the Fells, and some distant points.

Contrary to general expectation, Turkey Swamp is very interesting. It occupies the centre of the western half of the Fells, and is destined some day to be one of the most beautiful attractions. Even now the millions of cat-o'-nine-tails lend it a charm. In 1873 the town of Winchester secured the right to use this area as an additional source of water-supply. At that time it was feared that the north reservoir would be inadequate, and it was also expected that the town would be able to sell some of its water. The right was secured, and a dam built at the southern end; but the opportunity to sell water not being realized, and the present reservoir continuing to be sufficient, it was impossible to secure the appropriation necessary to complete the new one. Winchester showed great foresight in securing this valuable privilege. The water will eventually be needed by that and other municipalities; and if the water-shed, as well as water area is secured, the town will be wise indeed. The water could then be kept free from contamination, and the supply increased by the forest which would cover the hills. The area of the reservoir will be 140 acres, and the area of the water-shed 600; its surface will be ten feet above the north reservoir.

Turkey Swamp is very irregular in shape, and may be divided into several sections, the principal point of division being near the centre of the west side, where there is a small dam at which it is possible to cross at any season of the year. Cart-paths cross the swamps at two other points in dry seasons. The upper portion can be reached by a wood-

<sup>1</sup> The Winchester reservoir is 136 feet above the Mystic dam. According to the article in the "Transcript," Dec. 31, 1879, it is three feet higher than Spot Pond. It was constructed in 1878.

road leading from Main Street, Stoneham, not far from the Medford line: this road divides, the southern branch crossing at the little dam, then passing some fine pines, and coming out in Winchester at the head of Mt. Vernon Street; the northern branch skirting the southern slope of the hill which lies between the present reservoir and the swamp, passing the high-service reservoir, a small round building on the top of a hill, and coming out in Winchester at the head of Wilson Street (a new street not yet laid out) and also at the reservoir dam. The windmill at this dam pumps the water into the high-service reservoir.

In the Winchester section of the Fells are several groves of pines, the one overlooking the reservoir being perhaps the pleasantest. The hills afford good views, and can be reached by various paths; the highest point, an elevation of about 270 feet, is most easily reached by a wood-road which branches from the Mt. Vernon Street wood-road.

The large dam at the southern end of Turkey Swamp is best reached from Winchester by a lane which leaves Main Street a few rods north of the Medford line. Care should be taken to leave this lane at a point where a cart-path crosses an open cultivated field. One can also find this lane from Chestnut and Mt. Vernon Streets, but with more or less risk of getting lost. The easiest way to the dam from Medford is by a long and pleasant wood-road, which is very easy to follow after it has been found. The lower end starts from a field a little to the right of the upper end of a lane which leaves Purchase Street not far from High Street. The upper end loses itself in the works at the dam. On the west side of this wood-road is a hill which gives a fair view. The dam is also reached by following Brooks Lane from Medford Square. There is a perfect maze of wood-roads between Pine Hill and the swamp, but by paying strict attention to the map the way can be found. The proposed line of division between Medford and West Medford (the town of Brooks) starts at Spot Pond and runs nearly south-southwest, leaving Turkey Swamp on the right and striking High Street near Purchase.

Pasture Hill is near the centre of Medford, and affords a view of the town and the Mystic Valley. It is easily reached

by Brooks Lane, which takes its name from Governor John Brooks. The entire length of this wood-road is delightful for a walk. Leaving the residence of Governor Brooks on the left corner of High Street, the lane passes a brick house, one of the old forts of the Indian times, runs along the foot of Pasture Hill, then between fields where once were farmhouses, and finally through the woods to a point on Forest Street, half-way between Pine Hill and Spot Pond.

Pine Hill, about 282 feet,<sup>1</sup> is the highest elevation on the southern line of the Fells. The summit is sharp and rocky. The view embraces the Milton Hills, the ocean on both sides of Nahant, and Boston surrounded by its suburbs and harbor. The Mystic Valley lies in the foreground, and just beyond appear the buildings of Tufts College on the summit of College Hill. The northern half of the view shows the wilderness of the Fells region. Distant points are seldom visible. The hill is ascended by two paths, — one from the late residence of Mr. Wright, and the other from the road which leads to the old granite quarries west of the hill. Under the careful protection of Mr. Wright, many young pines have been springing up on the slopes of the hill, and especially on the rocky land west of the quarries.

Of the many rocky eminences north of Pine Hill, the one which gives the best view might be called Silver Mine Hill. At its northwest base is a deep shaft where the precious metals were sought a few years ago. More money was sunk in the hole than was dug out of it. The extensive wooded elevation north of the mine was called by Mr. Wright, Mt. Lincoln. He said he could get a good view from this hill by climbing a tree. I presume I have never found the tree he climbed.

In the depression south of Spot Pond and between Forest, Elm, and Fulton Streets, is a pretty pond made for ice-cutting. A higher dam would flow a large area and furnish a good supply of water. It would be wise policy on the part of Medford to secure this area as a future addition to her water-supply; for if the municipalities which now draw upon Spot Pond continue to grow in population at the rapid rate of the

<sup>1</sup> The height as given by Mr. Wright, obtained by levelling.

past five years (an increase of nearly 31 per cent), and do not secure additional supplies, then in some dry season Spot Pond will merit its name, not on account of the spots of rocks upon its surface, but on account of the spots of water among the rocks. Near the centre of this area south of Spot Pond is a large boulder which can be reached by several foot-paths, the one from the northwest being the best, especially in wet weather.

That region which lies between Forest Street and Highland Avenue is not specially interesting. A view can be obtained from the rocky peak close by the Malden line and near the lane which is called Murray Street, and another from the pile of rocks which crowns the rugged cliffs just north of the proposed Valley Street. This latter tract is now being opened to settlement, a new street having been already built to the top of the hill, and plans being now in preparation for laying out house-lots. Those who enjoy a ride on a truly rural road should try Fulton Street. It was built in 1641 by Charlestown, to gain access to her land north of Medford.<sup>1</sup> At that time Charlestown completely surrounded Medford. Lest any one should be misled by old maps, it is well to add that a portion of Medford was annexed to Malden in 1877.<sup>2</sup> From Salem Street to the Stoneham line the width of this strip, east to west, is 990.64 feet.

The section which is bounded on the west by Highland Avenue, Fulton and Wyoming Streets, on the north by the Ravine Road, on the east by Washington Street, and on the south by the settled portion of Malden, is the most rugged part of the Fells. Its rocky peaks are its leading features, and it therefore well deserves to be called "Fells." Many of its cliffs are remarkably fine, and some command good views. It contains several fine groves of pines and hemlocks, and in the wet season many small ponds. A labyrinth of wood-roads and foot-paths must be disentangled before one can plan and carry out a visit to all its attractions.

The finest cliffs in the vicinity of Boston are on the east side of this section, near the Fells Station on the Boston and

<sup>1</sup> History of Medford, by Charles Brooks, 1855, p. 51.

<sup>2</sup> Acts of 1877, chap. 139, and Acts of 1878, chap. 19.

Maine Railroad. They alone are worth a visit. In a depression in the ledge between the two highest points of rock is the "Cascade," the only waterfall of which the Fells can boast. The brook comes from the hills and swamps, and on account of the limited area of the watershed, is dry in summer. In the spring, however, the cascade is beautiful, and sometimes in winter the interesting ice-work renders it even more attractive. Farther north, near the point where Washington Street crosses the line from Melrose into Stoneham, is a fine grove of pines, — a remnant of that famous pine and hemlock forest which only a few years ago extended from Melrose to Spot Pond on both sides of the Ravine Road. Although the axe and the mill have destroyed the charm of this drive, there are still left several sections which are well worth serious efforts to save. On the elevated ground south of the Ravine Road a high-service reservoir is in process of construction for the town of Melrose.

In the interior of this section of the Fells are two pretty ponds, which exist during the entire year unless the season is extremely dry. They are called Shiner and Hemlock Ponds. I have not seen any shiners in either of them, but the latter has some fine hemlocks crowning the rocks at its northern end. This pond and its grove are well worth a visit to one who enjoys a charming bit of Nature. East-northeast of Hemlock Pond, and not very far distant, is an immense rectangular pile of rocks, — two sides of which, however, have fallen down, — marking the highest elevation in the eastern half of the Fells, about 300 feet.<sup>1</sup> This is the Stone Monument. From its top one can get a good idea of the rocky nature of the region; and if an observatory were built, an extensive view in all directions could be enjoyed.<sup>2</sup>

The two ponds and the Stone Monument can be easily reached from either of the several highways, provided the pedestrian knows the way. It is hoped that the map will

<sup>1</sup> Aneroid measurement.

<sup>2</sup> The stone which serves as the common bound of Malden, Medford, and Stoneham is a few rods southeast of the Monument; and 990.64 feet south 66° east of that is an old rock, marked M. M. S. No. 1, the present bound of Malden, Melrose, and Stoneham, and the former bound of Medford, Melrose, and Stoneham.



help any one with a good bump of locality to know the way before he starts. A stranger wishing to visit the ponds is advised to take the wood-road which leaves Wyoming Street near the southeast corner of Spot Pond. The path from Hemlock Pond to the Monument is hard to find; but, the Monument once found, the path to the pond is plain. Hemlock Pond is also easily reached by a wood-road which leaves Fulton Street, Medford, at a point opposite a small house standing close to the street. The wood-roads leading into this section from Malden and Melrose, especially the Bear Den Path, are good; but the stranger should be careful in following them, unless he is willing to get lost. And why not get lost? If you have a compass and plenty of time, — and both of these you always should have when tramping in the woods, — what greater charm is there than to wander hither and thither, wondering what beautiful bit of Nature you will stumble upon next! It may be a precipitous cliff or a mossy glen, a grove of noble pines or hemlocks, an interesting boulder or a pretty flower, a beautiful pond, an extensive view, or a wilderness of charming cat-o'-nine-tails.

That section which lies in Stoneham near Franklin Street is not specially attractive, and probably would not have been included by Mr. Wright within the limits of the Middlesex Fells had it not been a part of the Spot Pond water-shed. Doleful Pond merits its name, for it is largely surrounded by swampy land and its chief inlet rises in a swamp. There are several hills commanding northeast views, and many pleasant paths, the chief one being a cart-path which goes from Pond Street through to Green's Lane. I am indebted to A. Selwyn Lynde, Esq., of Melrose, for valuable assistance in tracing the paths in this section.

In concluding, it may not be inappropriate to say a few words concerning the present prospects of the Middlesex Fells movement, and to summarize the arguments in its favor. In the death of Elizur Wright the Fells lost their most enthusiastic friend. His energy can no longer be relied upon. Does it not, therefore, become the duty of all who are interested in the project to increase their efforts? Mr. Wright once wrote: —

"The people must move and act spontaneously, if anything is done. It is everybody's axe; and if nobody grinds it, it will be dull for the generations to come. The wood-choppers are sure to grind theirs while a tree is left. Here is work for the press, the pulpit, the platform, — for every one who likes to breathe pure air, drink pure water, and see green things."<sup>1</sup>

It is hoped that the publication of this map will, by enabling people to become more familiar with the region, stimulate public interest in the work. The task is undoubtedly a difficult one. To insure success it must be pushed by influential men, and their efforts must be seconded by a generous public. Little assistance can be expected from the city and towns within whose borders the Fells lie; for they are at present growing very rapidly, and are so burdened with necessary improvements that they do not feel able to appropriate money for this purpose from their treasuries. They do not, however, realize what a fine opportunity they have for securing a natural park. The city of Boston, which would be largely benefited, is already struggling with an elaborate system of parks within its own borders. The Forestry Congress, held in Boston last September, was addressed by Mr. Wright on the subject of the Fells. A committee appointed by this meeting will endeavor to secure further legislation to secure the protection of forests from fires, and are in consultation with a few prominent friends of the Fells as to what further measures it is advisable to take to secure the success of that project.

It is not necessary to dwell upon the arguments which are familiar to all, — that the northern portion of Boston and its northern suburbs need a park just as much as the southern portion and the southern suburbs need Franklin (West Roxbury) Park; that contiguous real estate will increase in value, and the neighboring towns become more desirable for residences; that a valuable opportunity is offered to secure, not the ordinary garden-park with fountains, flower-beds, and gravel-walks, but a unique park, one after Nature's own heart, and in which she can be enjoyed in her simplicity, unadorned by man's artificial devices; that a large annual

<sup>1</sup> Melrose Journal, March 17, 1883.

income can be derived from a well-managed forest, as is proved by European experience; that the forests increase and preserve the water-supply by storing up the spring and fall rains and protecting the springs from drying up; that a natural park would offer valuable educational facilities and lead the people to study the rocks and flowers, and especially our New England forest-trees; that here the city child could catch his first glimpse of Nature, and the overworked professional or business man and the tired laborer could find recreation and relief; that the "appreciation of the beauty and use of absolutely rugged and wild scenery"<sup>1</sup> would become general.

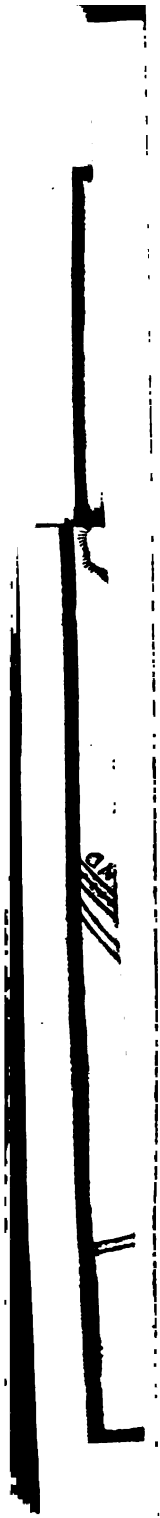
A more serious aspect of the subject is presented to the mind when we recall the difficulties with which Boston is now contending in preserving the purity of her water-supplies. Even the town of Winchester, situated within the basin of one of Boston's supplies, is fighting the owner of a large piggery which lies upon the water-shed of her own reservoir. Already there are several cheap dwelling-houses upon the water-shed of Spot Pond,<sup>2</sup> and the rapid growth of Stoneham will, before many years, wake the people who drink Spot Pond water to a realization of their folly in not securing the water-shed for public park purposes, and thus preserving the purity of the water. Moreover, the large increase in population and valuation of all five municipalities during the past five years<sup>3</sup> emphasizes the desirability, from every point of view, of establishing a public park in their midst. Now is the time to act; for the four thousand acres are practically unsettled, and real estate is cheap.

<sup>1</sup> Frederick Law Olmstead, Herald, Nov. 14, 1880.

<sup>2</sup> Near Franklin Street.

<sup>3</sup> Recent growth of the municipalities within the Middlesex Fells:—

	Population.		Real-Estate Valuation, 1885.
	1880.	1885.	
Malden . . . . .	12,017	16,407	\$10,555,060
Medford . . . . .	7,578	9,041	6,185,425
Melrose . . . . .	4,560	6,101	4,374,250
Stoneham . . . . .	4,891	5,652	2,710,835
Winchester . . . . .	3,802	4,390	3,069,722
Total . . . . .	32,848	41,591	\$26,904,782





## Accurate Mountain Heights.

BY EDWARD C. PICKERING.

Read December 11, 1885.

OF the various methods of determining the height of a mountain, the best is undoubtedly that by running a line of levels to its summit. This method is accepted as the standard, and as that by which the errors of the other methods are to be judged. A surprising degree of accuracy can be attained in levelling an ordinary country. Many of the errors compensate, and the final results should generally be accurate within a small fraction of a foot. In ascending a mountain, much greater deviations must be expected. The back sights are usually longer than the fore sights, and therefore errors in the adjustment of the level or in the correction for atmospheric refraction are cumulative. The effect of the mass of the mountain on the level would produce an error which would not be compensated, and might be large enough to be appreciable. Finally, an error in the length of the levelling-rod would enter to its full proportionate amount. For these reasons much reliance should not be placed upon the fractions of a foot, unless the above sources of error have been considered and proper corrections applied. The precise heights as determined have, however, been given below.

The labor and cost of levelling prevent its general application to the determination of mountain heights. A few lines of level have been run up the hills and mountains in this portion of the country, generally by the enterprise and enthusiasm of volunteers. A description of several of these lines has been collected from various sources, generally from the local newspapers. The principal results are published below for permanent reference. Doubtless many similar measurements have been made, and it is hoped that they may be communicated to the writer as material for a second paper. As an example of the danger that such material may be totally lost, it may be mentioned that scarcely any of the results given below are contained in the excellent "Dictionary of Altitudes

of the United States," recently published by the United States Geological Survey.

The following table contains a number for reference, the name of the mountain or other object measured, and its height above the mean tide-level of the ocean. Additional information regarding many of these points is contained in the notes following the table. Nos. 1 to 10 are taken from "The Geology of New Hampshire," Vol. I.; Nos. 11 to 17 from an article by Mr. J. J. Holbrook, "New Hampshire Sentinel," Nov. 22, 1877, where the altitudes of several other points in Cheshire County, N. H., are also given. All of these stations are in New Hampshire; Nos. 18 to 43 are in Vermont, and Nos. 44 to 63 in New York.

	FEET
1. Mt. Washington . . . . .	6,293
2. Upper water-tank, Mt. Washington Railroad . .	5,800
3. Second tank (Jacob's Ladder) . . . . .	5,468
4. Waumbek Junction . . . . .	3,910
5. Ammonoosuc Station . . . . .	2,668
6. Half-way House . . . . .	3,840
7. Glen House . . . . .	1,632
8. Kearsarge (S.) . . . . .	2,942.79
9. " Garden . . . . .	2,622.50
10. " Plumbago Point . . . . .	1,705
11. Monadnock . . . . .	3,169.3
12. " Mountain House . . . . .	2,071.984
13. John Mann's, near divide . . . . .	1,487.602
14. Jaffrey Schoolhouse No. 12 (threshold) . . .	1,231.227
15. Troy Schoolhouse No. 3 (lowest step) . . .	1,166.112
16. Beech Hill . . . . .	1,060.566
17. " " Reservoir . . . . .	594.589
18. Mt. Mansfield (Chin) . . . . .	4,389.08
19. Mt. Mansfield (Nose) . . . . .	4,056.39
20. Summit House . . . . .	3,841.64
21. Ridge southeast of Summit House . . . .	3,612.38
22. Half-way House . . . . .	2,306.38
23. Junction of Notch Road . . . . .	1,291.85
24. Bench near J. Houston's . . . . .	955.05
25. Mansfield House, Stowe . . . . .	720.27
26. Methodist Church, Waterbury Centre . . .	712.53
27. Killington Peak . . . . .	4,220.87
28. Summit of the second ridge . . . . .	3,546.31
29. Rock, summit of the first ridge . . . . .	3,385.48
30. Bench, rock near Manley's barn . . . . .	2,097.61

	FEET
31. Bench, rock near R. Maxham's . . . . .	1,812.72
32. Junction of the mountain road, Sherburne . . . .	1,504.77
33. Hotel, Sherburne . . . . .	1,211.21
34. Congregational Church, Bridgewater . . . . .	892.39
35. Mt. Tom (north peak), Woodstock . . . . .	1,351.22
36. " (south peak), " . . . . .	1,244.12
37. Little Killington . . . . .	3,951
38. Base of the Town Hall, Woodstock . . . . .	697.69
39. Pico . . . . .	3,935
40. Shrewsbury Mountain . . . . .	3,707
41. Shrewsbury Peak . . . . .	3,838
42. Camel's Hump . . . . .	4,077
43. Ascutney . . . . .	3,163
44. Whiteface Mt. . . . .	4,871.655
45. " (spring) . . . . .	2,817.958
46. " (brook, second crossing on trail) . . . . .	2,023.965
47. " (brook, first crossing on trail) . . . . .	1,959.996
48. Lake Placid . . . . .	1,863.715
49. Mt. Marcy . . . . .	5,344.243
50. " (Hump) . . . . .	4,998.278
51. Lake Tear of the Clouds . . . . .	4,321.958
52. " " " (summit of notch) . . . . .	4,355.313
53. Panther Gorge . . . . .	3,353.687
54. Mt. MacIntyre . . . . .	5,112.730
55. Mackenzie Pond Mountain . . . . .	3,789.322
56. Mt. Skylight . . . . .	4,889.626
57. Gray Peak . . . . .	4,902
58. Haystack . . . . .	4,918.626
59. Bartlett (west shoulder) . . . . .	2,785.512
60. St. Regis Mountain . . . . .	2,888.298
61. Lyon Mountain . . . . .	3,809
62. St. Regis Lake (Lower) . . . . .	1,623.162
63. Raquette Lake . . . . .	1,774.249

1. The height of Mt. Washington was determined in 1853 by Captain Cram of the United States Coast Survey (C. S. Reports, 1854, p. 39, App. 34; 1870, p. 90). Another determination in 1852, by Mr. William A. Goodwin, gave the elevation as 6,285 ("The Geology of New Hampshire," vol. i. p. 88), and apparently resulted from a line of levels.

8 to 10. Carriage-road survey by Mr. R. S. Howe.

11 to 17. Levelled by Mr. J. J. Holbrook.

18 to 26. Levelled by Mr. Hosea Doton, aided by Messrs. W. W. Ware and J. K. P. Chamberlain. They started from the railway station at Waterbury, and assumed the height of the top of the sleepers at that



point to be 425 feet. Professor Guyot, in 1866, found the height of No. 18 to be 4,386 feet, from a series of barometric measurements made every fifteen minutes for twenty-four hours. Another measurement recently made by him gives the height 4,387.25 (reprinted from Walton's Journal in "Vermont Standard," Oct. 15, 1885, where the elevations of twelve other points on this line are also given). Mr. Doton states that he used an eighteen-inch Y-level made by J. Sawyer, of Yonkers, N. Y., with a "New York" rod. The back and fore sights are usually made as nearly equal as possible without actual measurement. When it was necessary to make the sights unequal, the correction for curvature and refraction was applied. The lines were run up the mountain, and not down. An independent determination of the heights of Nos. 18 and 19 has been made by the Hon. J. P. Bradley. A line of levels gave the height of the Butler House in Stowe to be 851.70. A triangulation from a base measured near this point gave the height of No. 18 to be 4,387.25 and of No. 19, 4,061.46. This is a close agreement, considering the means employed, and a satisfactory proof that no serious error occurs in the line of levels. A line of levels has been run to No. 18 by the Coast Survey, but the result has not yet been published (C. S. Report, 1883, p. 29).

27 to 37. In 1863 Mr. Hosea Doton, assisted by Messrs. W. S. Dewey, J. K. P. Chamberlain, and R. A. Perkins, ran this line of levels, starting from White River Junction. Professor Guyot, by a careful barometric measurement, found the height of No. 27 to be 4,221.39 ("Vermont Standard," Oct. 11, 1866, where the heights of forty-six other points on this line are also given). The height of White River Junction was assumed to be 351 feet. In "The Geology of New Hampshire" (vol. i. p. 251 *et seq.*) it is given as 369.237. If this value is correct, the heights of Nos. 27 to 37 should be increased by 18 feet.

38 to 41. Determined trigonometrically from No. 27, No. 38 is 2.55 miles north; No. 39 is .92 miles southerly; No. 40 is 2.50 miles southeasterly; No. 41, also called Mendon Peak, is 1.44 miles south of west ("Vermont Standard," Oct. 11, 1866). The height of No. 41 is there given erroneously as 3,898.

42. Levelled by Mr. Charles Collins at the time of the building of the Vermont Central Railroad, of which he was one of the engineers ("Vermont Standard," June 8, 1871).

43. Levelled by Messrs. H. F. Dunham and D. C. Bell from a bench in Harland ("Vermont Standard," June 8, 1881). The bench appears to have been the summit of Garvin Hill, which was levelled from the base of the town hall in Woodstock by Mr. Hosea Doton, assisted by Mr. Charles Marsh. For further details, see the "Woodstock Post," Jan. 16, 1874.

44 to 63. All of these heights have been taken from the "Seventh Report of the Adirondack Survey," by Mr. Verplanck Colvin. Unfortunately, this work is entirely out of print. The heights of a large

number of other points are given in the same work. No. 61 was not determined by levelling, but from the mean of two months' observation with the barometer.

The following additional heights of the rail at various railway stations may prove useful; they are taken from "The Geology of New Hampshire," Vol. I.: Winchendon, 992; Peterborough, 744; Keene, 478.58; Bellows Falls, 304.58; White River Junction, 369.237; Woodsville, 448; Manchester, 180.882; Concord, 252.397; Plymouth, 473; Warren, 736; Littleton, 817; Wing Road Junction, 1,019; Bethlehem, 1,187; Lancaster, 870; Groveton Junction, 901; Shelburne, 723; Gorham, 812; Conway Corner, 466; North Conway, 516; Fabyan House, 1,571. The height of the lower Connecticut Lake is 1,618.863. The height of the Twin Mountain Station, as given in "The Geology of New Hampshire," p. 266, is 1,446; as given on pages 274 and 288, it is 1,375. The height of Bacon's Mills is given on page 271 as 922; but is apparently copied erroneously, as 992, in the "New Hampshire Sentinel" for Nov. 22, 1877. In the latter paper attention is called to the fact that the height of Marlborough Station is given (and probably correctly) as 789 feet on page 260, while on page 284 the heights of two bridges in Swanzey are given as 1,072 and 1,022. The water flowing under these bridges (which are only of moderate height) comes from below the Marlborough Station.

---

## An Exploration of the Pilot Range.

By W. H. PEEK.

Read February 10, 1886

IN APPALACHIA, Vol. I. No. 1, is the report of a committee on the nomenclature of the mountains. In this report is a proposition to include in Section D the mountain region having boundaries as follows: Upper Ammonoosuc River, Grand

Trunk Railway, Dead River, Androscoggin River, Moose River, Israel's River, and Connecticut River. This section includes a mountain mass which, in contradistinction to the Great Range to the southward, was entitled, by the settlers of the Upper and Lower Cohos, or "the Cöos country," the Pliny Range, or the Pliny Mountains. This name is as old as Colonel Whipple's time, or more than one hundred years.

But its most prominent peak is near the northern extremity of the district, and from a remote time has borne the name of Mt. Pilot. This fine though not very lofty mountain was, in the days when in this region roads and settlements existed not, of great service in pointing the way, not only for hunters, but for exploring and marauding parties, who passed all too frequently through the Androscoggin valley and the Dead River to and from Canada and the Atlantic coast. In the course of time the other mountains not far from it, and of the same chain, having no individual titles, were grouped with it, under the name of the Pilot Range,—but rather indefinitely, as it appears. Thus the almost unknown heights to the south and southeast are generally included in this range, though some of the outlying hills have local names, such as "Deer Hill," "Peaked Hills," and "South Peak." In the course of time new settlements multiplied local names,—uncertain or contradictory at times, no doubt, and quite generally of a territorial character rather than descriptive or characteristic; so that mountains or rivers extending through more than one township would be likely to receive several names,—that is, the names of the towns in which they were situated.

Now, when it is remembered that between the Randolph road or Moose River and Jefferson on the south, and the settlements on Dead River and the Upper Ammonoosuc on the north and northwest, a distance of twenty miles, search may be made in vain for any permanent human habitation, it is not strange that our knowledge of this region should be small; limited as it is to the reports of hunters and fishermen, who seek the thickly wooded banks of the streams, or to the accounts of logging parties, who judge of the character of the country by the quantity or quality of its merchantable timber. Comparatively recent writers, alluding to the

mountain mass seen to the west of Gorham, call it the "Pilot Wall," or the "Pilot Mass;"<sup>1</sup> and other "authorities"<sup>2</sup> insist that Mt. Starr King — or, more properly speaking, the Pliny Range — is but a part of the Pilot Range.

It was to obtain and to present more definite knowledge of the general character of at least a part of this region, that the Councillor of Exploration, after long consideration of the subject, induced Mr. George A. Sargent, of Boston, and the writer to join him in an expedition which should attack the range from the north, with Groveton as the point of departure. Having secured the assistance of Mr. Hubbard Hunt, of Randolph, with a light tent and suitable supplies, on Thursday morning, August 6, at 7.48, we left the hotel at Groveton, taking the high-road which runs southerly and gives communication with "Lost Nation" and "Lancaster Gore." The road was a gradual ascent, and was mainly on the lower slopes of the Pilot Mountain, the heights of which we were soon to ascend.

When the road appeared to be leaving the mountain too far to the left, we concluded to abandon it, and aim directly at the mass of the mountain; but before this we had frequently turned to look back at the views to the northward, and gained glimpses of a beautiful prospect, the view broadening more and more as we gained greater height. Near the point at which it was determined to leave the road, we found some men at work on a farm. The men answered our questions readily, and gave directions for the ascent quite freely; but unfortunately their directions were quite diverse, and appeared to incline to the contradictory, so we took a middle course, which led, as compromises frequently do, into special difficulties, in the guise of an "old clearing," imperfectly burnt over, and left till a thick growth of young trees or bushes made the passage a delight to but one of us, and to at least one other an exhausting labor, which came near destroying not only the pleasure of the day, but his very hope of its successful issue. But hidden and treacherous logs were all passed in the course of time, and a rocky and boulder-covered opening

<sup>1</sup> Starr King's White Hills, pp. 248, 256, 297.

<sup>2</sup> Osgood's Guide to the White Mountains, p. 185.

gave us a welcome change of ground and a beautiful outlook to the west and southwest.

From this time we traversed the unbroken forest, thickly tenanted by the "gamiest" of all "small game," which we had been informed in Groveton, had all gone away weeks before. Active motion is the best safeguard from the bites of black flies, and our motions were not the less lively on account of their presence; so, following the principal ridge, we found ourselves at 12.15 P. M. on an eminence which seemed to tower above all we could see through the thick woods by which we were surrounded (Knob 1). But a further walk in the same general direction and another and higher point was gained at 1 P. M. (Knob 2), and soon after another; and yet another still higher at 1.25 (Knob 4). Then came a depression of some extent, and a greater ascent, which put us on the summit of *the* Pilot Mountain at 2.48 P. M. The top had been thoroughly cleared of trees, and an excellent flagstaff or pole erected for a signal station.

A young growth of spruces thickly covered the ground, but not so as at present to interfere with the outlook; and that outlook was a surprise and a delight. Though not so extensive as may be obtained from the highest summits, yet its height of 3,800 feet was sufficient to give us such a comprehensive view as cannot easily be obtained of the White Mountains in their largest sense and as one great whole; while the Connecticut valley, north and south, and the northern mountains, appeared to greater advantage than from any other point the writer had visited. The view of the mountains in Maine was also very favorable, and showed us many "old friends with new faces." But what on this special occasion interested us most, was the splendid revelation of the Pilot Range itself. Its bold and sharp lateral ridges extending westward from the crooked main ridge, and crossing our intended course at nearly right angles, showed us the obstacles we must encounter and surmount before we could reach the crowning height of the southern cluster. This view was magnificent,—inviting and stimulating to the young and the sturdy, but almost too grand for one who with more enterprise than prudence had taken up the task, and who

"with measured step and slow" must now and again beg for delay.

Bewitching, entrancing, as the Pilot panorama was, the time flew most rapidly, and much must be done before dark; so at 3.25 P. M., tearing ourselves away, and taking our course for the crowning dome so distant from us, we commenced the descent, which was found rather more sudden than convenient. But down the ledges (or precipices, if you please) we found the way rapidly, if not easily, into a deep valley, and over a minor ridge to another ravine, where dinner was enjoyed by those who were not too tired to eat it. It was a strictly temperance tavern; not a drop of fluid of any kind to be found in the neighborhood. After the repast the way was still pursued down or across a deep valley; and as we were constantly searching for water, it was with great pleasure that we came to a small but excellent spring here; and at 5.45 P. M., we concluded to pitch our tent, — a little thing of less than four pounds' weight, which was soon put up and in order. Our good guide quickly had an excellent fire blazing; and rest soon showed us that we had good appetites, and sated appetites left demands for more rest. In the secluded dell which sheltered us, the wind which we heard above and around us did not reach us; and all night long, and even in the morning before sunrise, the air seemed comfortably warm, though the thermometer stood at only 45°.

Next morning we were stirring pretty early; and, breakfast over, we struck tent at 6.30 A. M., and made our way up and over a ridge eight or nine hundred feet above our camping-place. This passed, we were in a deep ravine at 8.20, and another at 9.55. Here we were directly under the Grand Pilot, — or the Pilot Dome, as it may properly be called, — and at the height of 2,665 feet above the sea. From this point the ascent was even and steep, if not rapid; and as the strong so kindly aided the weaker, the speed was fair, if not fast, so that by 11.30 A. M. those who were foremost insisted that they were on the very summit. The others doubted, as they saw on the left more than one eminence of greater apparent height, one of which at 12.10 P. M. was reached and measured. The observations gave 4,230 feet as the height.

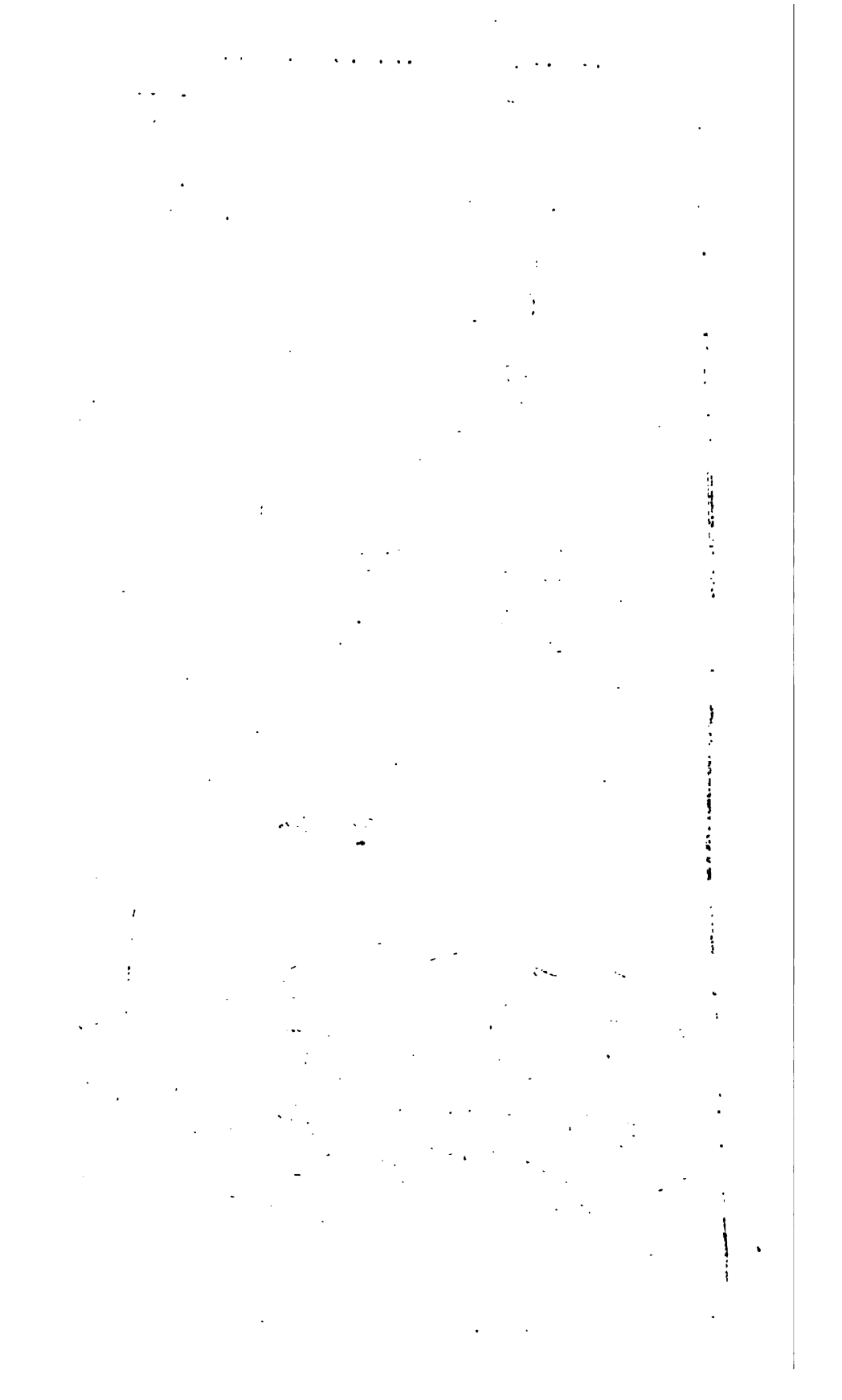
The top is dome-shaped and large, not thickly covered with trees; but on account of the slope being very gradual, the view is much obstructed. On climbing a tree the Councillor exclaimed with delight, "We are undoubtedly on the summit of the ridge, for I can see over all the neighboring heights." Notes and sketches were hastily (it is hoped not carelessly) made; and we may say that for special views — pictures framed, as it were, by mount or forest — this elevation will some day be a favorite spot.

The Great Range appears to excellent advantage, towering as it does above the grim ramparts of the Pliny Range. These frowning heights of the Pliny Range send ridge behind ridge to the south wall of Bunnell Notch to the eastward, while other ridges fall away from the widening valley, or Willard Basin, which we were soon to enter. In its turn, Cherry Mountain, at a greater distance, forms an intervening redoubt for the Franconia Mountains; and more to the right was the lovely valley, opening on the plains of Lancaster, and including Mt. Prospect, Bray Hill, Lunenburg Heights, and ridge retreating behind ridge in exquisite gradation of tint and beauty of form. On the southeast were heights, to us nameless, but noble in form, some of them soon to be visited by the more vigorous of our party; and beyond them were the scenes of our earlier explorations, — the Pond of Safety, and the Crescent as well as the Randolph Ranges, which, though pygmies to the Pilots, were well displayed, and fitted admirably in the landscape as the outworks of Madison, and the Carter-Moriah Range; while through an embrasure-like opening of the Crescent Range the white top of Mt. Surprise has just space enough to be conspicuous.

But down the valley, south and west, lay our way; so at 1.15 p. m., regretfully leaving this place unsullied and perhaps previously unvisited, our guide started down the steep incline, and after a long and rapid walk enough water for drinking and cooking was found. Here we saw one felled tree, which must have lain there very many years. Before this we had seen no mark of axe since leaving the Pilot Mountain proper at the signal station; but it will probably not be long before the iron horse itself will penetrate these wilds, and carry off the spoils of these hitherto inviolate solitudes.







Our dinner leisurely disposed of, our course considered and determined, we cross the basin in part, hoping to find a brook, and a road leading to the settlements. We found them both, and both together; and very loath to part they seemed, for bridge followed bridge, this way and that, with intervals of road full of thickly growing young trees. We crossed these bridges in order and out of order, at least twenty-five in number. The road so thickly overgrown and the bridges so rotten told of long neglect, though we occasionally saw the discarded poles left by the casual fisherman. More than three miles of this walking we had before we entered a strip of meadow, and farther on saw men loading wagons with hay. Now we thought our trials were over; but we had a little more, for beyond the meadow was more than half a mile of very muddy lane, which we were glad to leave behind, as we reached the high-road in Lancaster township, five miles at least from the summit of the "Dome." Following the various turns of the road to Jefferson, we passed a party of surveyors with theodolite and staff,—ominous of railways. They stared at us, and we at them. Each thought the other party out of place, we may presume. Soon after this we rested, and took a last long look at the scene of our journey as it grew softer under the declining light of evening, and then on to Jefferson, and thence to the Ravine House in Randolph, reaching that place at 11 P. M.

From later developments it is evident that even at that time resolutions, unexpressed but unanimous, were made to visit the range once more and do what may be done to complete the survey.

---

## Mountain Meteorology.

BY WILLIAM MORRIS DAVIS.

Read November 11, 1885.

THERE are certain peculiar meteorological phenomena, characteristic of high-level stations or of stations situated within a mountain region, that seem especially worthy of attention

in the Appalachian Mountain Club. The generally high estimate of the importance of these phenomena is illustrated by the labor and money that have been given to the establishment and maintenance of mountain observatories on Pike's Peak and Mt. Washington by our Signal Service; on Ben Nevis, the Brocken, Puy de Dôme, Pic du Midi, Säntis, Hochobir, and various other mountains in Europe; and, newest of all, on our neighboring Blue Hill.<sup>1</sup> The only regret encountered in approaching the interesting results thus gained is that we Appalachians, in the ten years of our organized existence, have as yet taken no part in the accumulation of such knowledge.

A paper on mountain meteorology must discuss questions of three kinds. There is, first, a series of conditions, such as low pressure and temperature, characteristic of the upper air into which a mountain rises, but independent of the mountain itself; next are the phenomena directly excited by the mountain's form and mass, such as the diurnal winds and rains of mountain countries; finally, there appear certain peculiarities of weather in winds of distant origin that encounter mountains on their course, as on the dry and rainy sides of a range. Examples of all these effects are here collected. Besides the frequent references made to Dr. Hann's writings, I am especially indebted to his admirable "Klimatologie," from which much is taken without further acknowledgment than this.

*Pressure.* — The diminution of atmospheric pressure as we rise above sea-level is a very natural result of leaving some of the atmosphere below us. In moderate ascents we are unconscious of the change, except by instrumental aid; in rising to heights over five or ten thousand feet, it becomes difficult to take a long, satisfying breath, and exhaustion is likely to follow moderate exercise, — nausea, or "mountain sickness," attacks many of those who climb Pike's Peak, — but this rapidly passes away, and most persons may soon become accustomed to the lessened pressure if there be opportunity

<sup>1</sup> An account of the European mountain stations and of the share that the Alpine clubs have taken in their equipment may be found in a paper by A. Lawrence Rotch, *Amer. Meteorol. Journ.*, 1886.

to remain in it. Some are very slightly affected in this way. Whymper, who has had much practice in mountain climbing, spent the night on Cotopaxi without difficulty, and climbed Chimborazo without suffering from mountain sickness. The great altitudes at which men can dwell show how much greater variation can be borne in the density than in the composition of the air.

	Altitude.	Pressure.	Mean Temperature.
Signal Station, Pike's Peak, Colorado	14,134	17.75	19°.2 F.
San Vincente, Bolivian Andes . . .	15,022	17.1	about 37°
Convent of Haule, Thibet . . . .	15,120	17.0	about 35°

But the diminished density of the air has an effect in weakening a people living at great altitudes, presumably by the insufficient supply of oxygen for the oxidation of the blood.

The boiling temperature of water is lowered as the atmospheric pressure is reduced, so that it is impossible to do good cooking on the higher mountains, unless a close lid, with safety-valve, is added to the pot, to prevent boiling until the desired temperature of 200° or more is reached.

The special features of the annual and diurnal variation of the barometer characteristic of mountain stations constitute a more technical subject than need be treated here. Students of this question should consult Dr. Pernter's papers in the "Sitzungsberichte" of the Vienna Academy (lxxxiv. 382); and in the Austrian "Zeitschrift für Meteorologie" (1885, xx. 321-326). The latter gives reductions of observations on Mt. Washington and on Pike's Peak.

The essential point to be considered is that when the atmosphere is contracted by cold so as to cause an inflow of upper currents, and hence a relatively high pressure at sea-level, there will be, nevertheless, a relatively low pressure at great altitudes, because so much of the air is condensed in the lower strata; on the other hand, when the atmosphere is warmed and expanded, causing an outflow of upper currents and a relatively low pressure at sea-level, there will be a relatively high pressure at elevated stations, because so much air is lifted above them. Thus the barometer varies inversely at high and low levels; but our New England mountains are not high enough to show the completed inversion. The retarded arrival of the minimum pressure in a passing storm at mountain stations will be referred to later.

*Composition.*—The theory that explains the arrangement of the atmospheric gases under the action of gravity requires that the composition of the upper air should vary from that of the lower air. The cause of this is found first in the law of gaseous diffusion that requires that every gas in a quiescent mixture of several gases shall finally arrange itself as if alone; and second, in the unequal elasticity of the atmospheric gases, so that a greater weight and hence a greater height of the more elastic gases, nitrogen and water vapor, than of the less elastic gases, oxygen and carbonic dioxide, would be required to produce a given density at the base of the atmosphere. Hence the nitrogen will decrease vertically somewhat slower than the oxygen, and much slower than the carbonic dioxide.

Dr. Hann gives the following results for total and partial pressures of oxygen, nitrogen, and carbonic dioxide, and for volume percentages of oxygen and nitrogen at different heights (*Zeitschr. für Meteorol.*, 1875, x. 25).

Altitude. Metres.	PRESSURE IN MILLIMETRES.				VOLUME PERCENTAGE.	
	Total.	Oxygen.	Nitrogen.	Carb. Diox.	Oxygen.	Nitrogen.
0	760	159.6	600.1	0.30	21.00	78.96
1,000	670	139	531.4	0.25	20.71	79.25
10,000	218	40	178	0.04	18.35	81.63
20,000	63	10	52.8	0.01	15.92	84.07
30,000	18	2.5	15.7		13.74	86.26
40,000	5	0.6	4.6		11.54	88.46
50,000	1	0.16	1.38		10.39	89.61
60,000	0.4	0.04	0.41		8.89	91.11

But the regular circulation and stormy overturnings of the atmosphere at all altitudes yet reached by man strongly interfere with the perfect accomplishment of the simple diffusive arrangement; for diffusion is effected but slowly, and the inequality of composition that it would produce is almost entirely prevented by the continual interchange of currents between the upper and lower air. Still, a slight difference has been detected. The analyses of air brought down by Welsh from high balloon ascents in England give the fol-

lowing percentages of oxygen : at 13,460 feet, 20.89 ; at 18,000 feet, 20.75 ; at 18,630 feet, 20.89 (Phil. Trans., 1853, p. 339). The average volume-percentage for oxygen on mountains is given by R. Angus Smith as 20.82 ; at lower levels, 20.96 (Air and Rain, 1872, p. 20).

The vertical decrease of carbonic dioxide should be more rapid than that of oxygen, and samples of air collected on our Rocky Mountain summits might be analyzed with interesting results ; but as far as such investigation has yet been carried, the results are contradictory, for in the Alps and on the Andes an *increase* of this gas has been found at great altitudes, while on the Pyreñees there is a slight decrease.

A good review of this question is given by Sprung in his new "Lehrbuch der Meteorologie" (Hamburg, 1885, pp. 99-105). Morley has shown that samples of air collected at Hudson, Ohio, during the passage of barometric maxima, in which the air descends from aloft, give a higher percentage of oxygen than during barometric minima (Amer. Journ. Sc., 1881, xxii. 417) ; but a similar discussion of Jolly's analyses at Munich gives an opposite result (Zeitschr. für Meteorol., 1882, xvii. 175).

The amount of water vapor nearly always diminishes vertically much faster than its distribution by diffusion would require. To explain this, it must be remembered that the vapor is an inconstant constituent of the atmosphere ; that it is supplied chiefly from the sea and from the earth's surface, at the bottom of the atmosphere ; that it is frequently withdrawn from the upper air by condensation to form rain ; and that diffusion, which would tend to reduce the excess below and make up the deficiency above, is seriously retarded by friction. The upper air is, therefore, relatively dry ; evaporation into it from a mountain surface is rapid.

Important papers on this question are by R. Strachey, "On the Distribution of Aqueous Vapor in the Upper Parts of the Atmosphere" (Proc. Roy. Soc., 1861, xi. 182-189) ; and J. Hann, "Ueber die Abnahme des Wasserdampfgehaltes mit der Höhe in der Atmosphäre" (Zeitschr. für Meteorol., 1874, ix. 193-200). The latter is translated by Professor Abbe in the Smithsonian Report for 1877 (pp. 377-385). It shows in the following numbers the great difference

between the pressure ( $p'$ ) of vapor at different altitudes, according to the theory of diffusion, and the observed pressure ( $p''$ ) from mountain ascents and balloon voyages; and also the agreement between the latter and the pressure ( $p'''$ ) determined by an empirical formula constructed by Hann. From this it appears that the total weight of the vapor in the air above us is only about two ninths of what might be inferred simply from the elastic force of the vapor at the place of observation. It is for this reason that mountain ranges so effectively divide moist and dry regions. A range only 6,000 feet high holds back one half of the atmospheric vapor; and the Himalaya (15,000 feet at its Passes) holds back eight tenths.

Altitude.	0 Feet.	4,000 Feet.	8,000 Feet.	12,000 Feet.	16,000 Feet.	20,000 Feet.
$p'$ . .	1.00	0.91	0.83	0.75	0.68	0.62
$p''$ . .	1.00	0.64	0.42	0.27	0.18	0.13
$p'''$ . .	1.00	0.65	0.42	0.27	0.18	0.12

The harmful impurities of the air decrease rapidly with elevation. Freudenreich has examined samples of air from great altitudes in the Alps, and finds them remarkably free from bacteria (Arch. d. Sciences nat., 1884, xii. 365-387). The following table is from "Ciel et Terre" (1885, p. 61), and gives the number of bacteria for a cubic metre of air from various localities:—

On the Atlantic Ocean . . . . .	0.6
In the cabins of vessels at sea . . . . .	60
On high mountains . . . . .	1
In Berne . . . . .	580
In Paris . . . . .	3-7,000
In hospitals of Paris . . . . .	40-79,000

So far as I have read, no observations of this kind have yet been attempted in this country.

*Color.*—The blue of the open sky increases in purity and intensity as we rise above the lower dusty air in ascending a mountain peak. Ordinary skylight is chiefly a mixture of white light that has been simply reflected from the relatively coarse particles of liquid or solid matter suspended in the air, and of light that has been "scattered" by excessively minute particles, which, as Lord Rayleigh has shown, have the power of "scattering" more of the fine blue than of the coarser red

waves. When the air contains an excess of relatively coarse particles, as in dusty, hazy, or cloudy weather, common at low-level stations, the blue color is diluted and may be lost by the plentiful reflection of white light. On the other hand, the very clean air of the upper regions reflects extremely little light, and its color is chiefly due to "scattering." The sky seen from a high mountain is therefore strongly blue; and its spectrum shows a marked deficiency of red.

I have here used the terms "reflection" and "scattering" as defined by Lord Rayleigh, whose writings on the color of the sky (*Philos. Magazine*, 1871, xli. 107) are of great importance, although seldom quoted. "Scattering," as there employed, practically corresponds to what was intended by selective reflection in the writings of Tyndall and others.

Sunrise and sunset yellows and reds along the horizon are seen in great intensity from mountain tops. These strong colors result from an effective absorption and scattering of a good part of the finer waves during the long, oblique passage of the solar rays through the atmosphere, and especially through the more impure lower layers near the horizon. For the same reason the "twilight curve" (*Gegenschein*) on the horizon opposite the setting or rising sun is strongly marked; for it is the return, by reflection and scattering, of light that has passed by the observer. When viewed from a mountain, this rosy arch opposite the sunset horizon is seen to be sharply interrupted by the mountain's shadow. The Signal Service observer first stationed on Pike's Peak began his record by noting the mountain shadow as something extraordinary; but it was soon found to be of regular occurrence in clear weather (*Report of the Chief Signal Officer*, 1874, p. 114). An attempt at an illustration of the sunrise shadow cast by the great Japanese volcano, Fuji-no-yama, is given in "*Harper's Magazine*" (1880, lxi. 653).

Diffraction colors are well seen for the same reason that the mountain sky is dark blue; the amount of reflected light is so small that the diffraction effects are not masked by it; and more than this, it is likely that the diffracting particles of frozen vapor in the higher air are more nearly uniform in



size than they are near the earth's surface, so that their colored rings do not seriously overlap and blend into white light. "Bishop's ring," the dusky reddish ring surrounding the white glare about the sun for the last two years, and attributed to diffraction on particles condensed from the vapor thrown out by Krakatoa in August, 1883, may, for these reasons, be seen from mountain tops while invisible in the whiter, brighter sky of neighboring valleys. The following authors may be referred to:—

Assmann (on the Brocken), *Meteorol. Zeitschr.*, Berlin, 1884, i. 196.

Forel (in the Alps), *Archives des Sciences*, 1884, xii. 173.

Tissandier (observations from a balloon), *La Nature*, 1884, xii. 355.

It was distinctly absent when Langley was on Mt. Whitney in 1881.

The blue color of distant mountains is not easily explained. The color is most distinct in fine weather; in hazy weather and at great distances the blue is very pale, and may disappear so that the mountain outline fades away as its color blends with that of whitish sky near the horizon. The whiteness of the sky at the horizon is doubtless due to plentiful reflection of sunlight from the coarse dust encountered in looking through a great thickness of air; in looking at a mountain the light from the air beyond it is cut off, and consequently that which reaches the observer is less intense. It has been shown by experiment that a decrease of intensity of a ray causes a *subjective* change towards blueness in our perception of its color. It is therefore probable that the blue of distant mountains may be in greatest part a subjective effect. The true colors of the mountain fade away as they are diluted by mixture with light reflected to us from particles in the intervening air. The rosy glow on snowy mountains after sunset is due to their reflecting to us those rays which best survive a long transmission through the air,—namely, the coarser red rays; and the persistence of this color after the lowlands are dark results from the long westward view that the mountain gains by its height.

*Temperature.* — Under this heading we must distinguish between the temperature of mountains themselves, regarded as projections above the general surface of the earth, and the temperature of the upper atmosphere, of which we have experience on mountain stations ; but, first, there are some general matters to consider.

It is not immediately apparent why the upper air, in full glare of sunshine, should be cold ; and it is worth while to state specifically the physical reasons for this condition. In the first place, it should be understood that the ordinary terms “ rays of light ” and “ rays of heat,” although very convenient and destined to remain long in use, are still misleading. They must not be taken at their face value, for the solar rays possess neither light nor heat ; they are waves of *radiant energy*, excited in the interplanetary ether by the molecular activity of the sun, spreading in all directions from their source at enormous velocity, and capable of exciting other forms of energy under proper conditions. Most of this radiant energy is “wasted” on open space ; the earth gets an exceedingly small share of it. Some of the waves, having suitable length, excite the sensation that we call light when received in the eye. In strict use, the word “light” should be employed in this sense. In the same way, if the energy of the ethereal waves is “absorbed” by sensible matter, the velocity of its molecules is increased, and the matter is thereby *heated* ; on touching it, we get the sensation of heat. Hence, as long as the energy resides in the ether, it is neither light nor heat, but it may be converted into the form of energy known as heat, or it may give us the sensation of light, when absorbed by some proper substance. Now, the air has small power of absorbing the solar waves ; hence the upper air is not easily warmed, although so well exposed to sunshine.

A passage from the “Lettres physiques et morales,” by J. A. de Luc, written in 1779, concerning the cold of the upper atmosphere, in spite of its being nearer the sun, is interesting in this connection : “Je me suis persuadé . . . que les rayons du soleil ne sont point chauds, et qu’ils ne sont cause de chaleur que par leur pouvoir de mettre en action une cause, résidante dans notre globe et son atmo-

sphère, et qui est ainsi la cause immédiate de la chaleur" (v. 530). This was building better than he knew; for the sequel includes much about the "fluide igné," which finds no mention in modern physics.

When compared, volume for volume, with other substances, the gases of the air are very poor absorbers of solar rays; but the depth of the atmosphere is so great that the rays are shorn of much of their strength when they reach the bottom of the atmosphere at sea-level. The great intensity of insolation on high mountains is, therefore, one of the most characteristic elements of mountain climate. The researches of Pouillet, Herschel, Frankland, Violle, and others may be consulted on this question; but of more importance than all these are the observations made by Langley with improved methods and under better conditions, as described in his "Report on the Mt. Whitney Expedition." His results are so unlike those previously accepted that our knowledge of the effect of the atmosphere in absorbing or otherwise disposing of solar and terrestrial radiations is at present in an unsettled condition; and his discoveries have followed one another so rapidly that it is difficult to keep pace with them. As they lead us rather into pure physics than to its application in general meteorology, they cannot be followed here.

Langley's report appeared as "Professional Paper XV., U. S. Signal Service," in 1884; and its narrative chapter as well as its author's lecture before the Royal Institution (Science, 1885, v. 441) should be read by all interested in scientific mountaineering. He finds that the upper air, weight for weight, is much more transparent to solar rays than at sea-level; this is most likely due to its clearness, and accounts well for the great difference of temperature recorded at high stations by shaded and sun-lit thermometers, and for the intense heat felt in the sunshine by mountain climbers at high levels.

There are other reasons for the cold of the upper air, in contrast with the warmth of that below. As already stated, the solar waves are much better absorbed by the land and the sea than by the air; and thus the surface of the earth rises during sunshine to a higher temperature than that of the adjacent air, and therefore emits radiation,—that is, excites waves of radiant energy in the adjacent ether; but these

waves are quite unlike those that come to us from the sun. Langley has lately shown that they are relatively very coarse and slow moving. We may suppose that the atmosphere can absorb them rather effectively,<sup>1</sup> and that the denser air near the earth is warmed by them more than the higher air. At any rate, the solid dust particles, the water droplets, the ice spicules, and the water vapor, all relatively plentiful in the lower air, absorb radiant energy of all kinds, and thus become important sources of warmth for the air about them. Again, the heat gained by contact of the air with the ground is not noticeably spread upwards by conduction, for the air is a wretched conductor of heat. Finally, the mechanical theory of heat requires that ascending and consequently expanding masses of air shall thereby cool, and that descending masses shall be warmed by compression. For all these reasons, however warm the air may be on the earth's surface, it will be cooler above.

According to the mechanical theory of heat, the temperature of the air depends simply on the velocity of its molecules. When a mass of air rises in an ascending current, its molecules find less pressure upon them, and therefore push aside the adjacent air and increase the total volume that they occupy as far as they can. But they have to do a certain amount of work in thus pushing aside the air to gain more room for themselves, and to do this work a certain amount of their energy of motion must be consumed; therefore, in consequence of expansion, their molecular velocity must be decreased, and thus the ascending, expanding air is cooled. A similar process of reasoning shows how a descending mass of air, crowded into less volume by the increasing pressure around it, has work done upon it whereby the velocity of its molecules is increased and it is warmed. The appreciation of these physical processes has wrought great advances in meteorology. Espy was the first to give prominence to the changes of temperature in vertical currents, as will be shown further on.

The temperature of the lower air is, as a rule, largely dependent upon that of the ground on which it rests. As the ground warms by day and cools by night, the air tries to

<sup>1</sup> I find that even this is now questioned in Langley's later papers; and hence the actual warming of the air is something of a mystery.

follow these changes of temperature, but cannot keep pace with them; yet the mean temperatures of the ground and the lower air are closely alike.

We have next to consider the vertical decrease of temperature in the air, and the relation of the temperature of mountain peaks to that of the air about them. The mean vertical decrease of temperature in the atmosphere is, roughly speaking, one degree Fahrenheit for every three hundred feet of ascent; but the decrease soon becomes slower, and must be very deliberate in the upper air, where the earth's surface, which exercises the chief control on air temperatures, is left far below. Thus the mountains of the torrid zone rise into a frigid climate whose mean annual temperature is equalled only by the polar parts of the earth at sea-level.

Hann gives, in his "Klimatologie" (pp. 151, 152), the vertical decrease of temperature for eight tropical mountains and twelve extra-tropical; the first average  $0^{\circ}.58$ , the second  $0^{\circ}.57$  C., for one hundred metres. This equals  $0^{\circ}.94$  F. in three hundred feet (to reduce centigrade degrees in one hundred metres to Fahrenheit degrees in three hundred feet, multiply by 1.64). The same author has determined this centigrade ratio for the Alps in an extended memoir on "Die Temperaturverhältnisse der österr. Alpenländer" (Wien. Akad. Sitzungsber., 1885, 2°, xcii. 75), which is here quoted with a number of similar results. The temperatures are centigrade, except where otherwise stated.

	Winter.	Spring.	Summer.	Autumn.	Year.	
Eastern Alps.						
N. slope . .	0.34	0.60	0.62	0.47	0.51	} Hann.
S. slope . .	0.50	0.66	0.67	0.57	0.60	
Switzerland .	0.32	0.67	0.70	0.56	0.58	Hirsch.
Alps. . . .	0.45	0.67	0.73	0.52	0.58	Weilenmann.
Mt. Washington } to Portland, Me. }	{ 0.46 0.75	0.60	0.57	0.55	0.55 C. 0.89 Fah.	} Hann.
Mt. Washington } to Burlington, Vt. }	{ 0.40 0.65	0.59	0.67	0.52	0.55 C. 0.89 Fah.	
		0.96	1.09	0.84		

A mountain peak is so small an interruption in the great expanse of air about it, that it cannot control the temperature

of the air at its level nearly so fully as the general surface of the earth controls the temperature of the lower strata of the atmosphere. The mean temperature of the lower air agrees closely with that of the ground on which it rests, but the mean temperature of the upper air is not so high as that of the mountains which rise into it; the difference is sufficient to be important in considering the distribution of animals and plants. Several numerical examples are given below.

Average temperatures do not, however, tell the whole story. Just as the ground readily absorbs incident waves of radiant energy so as to gain warmth easily, it also emits radiation or loses its heat by radiation rapidly; and being a poor conductor, its surface warms and cools quickly. In this it is unlike the open air, which is relatively conservative, and warms and cools less readily. We find, therefore, that the ground and the air close to it have greater annual and diurnal temperature ranges than the high open air; and, as a corollary, that the vertical decrease of temperature in the air is greater than the mean by day and in summer, and less than the mean at night and in winter. It must be borne in mind that the small range of the upper air does not result simply from its altitude or rarity, but from its lack of contact with the solid earth.<sup>1</sup> Thus, on a plateau the air temperature has a higher mean, more nearly equal to that of the plateau ground, and is more variable than that about a mountain peak of the same altitude. Indeed, the ground temperature on a plateau, and especially on a peak, has a greater range than near sea-level, where the atmosphere tempers insolation and retards radiation. Intense insolation and radiation are marked peculiarities of mountain climate; these, with the consequent strong variation of temperature and high mean temperature of the ground compared to that of the adjacent air, distinguish it from the Arctic climate.

Topography is so important in determining the range of temperature that it must have special consideration, basing

<sup>1</sup> Woeikoff, *Zeitschr. für Meteorol.*, 1883, xviii. 211, 241; *Meteorol. Zeitschr.* 1885, ii. 201. The latter paper gives a broad review of high-level temperatures.

the statement on the articles by Woeikoff, above referred to. We must carefully distinguish ground temperature from that of the air, and must remember that as the ground is quick to warm or cool, the ratio of the contact surface of earth and air to the adjacent volume of air will be an important factor in determining how far the air temperatures change as they follow those of the ground. At night, a convex mountain summit loses heat by unreturned radiation to more than a hemisphere of sky; a concave valley bottom cannot cool so fast, because a considerable share of its radiation is made good by return radiation from the valley slopes; and the greater density and impurity of the valley air also impedes effective radiation. In the daytime the excessive insolation on the mountain raises it to a high temperature; the insolation in the valley is distinctly weakened by atmospheric absorption and reflection. Hence mountain surfaces have a greater diurnal temperature range than valleys.

The temperature of the air in a valley at night is rapidly reduced by the large ratio of cooling ground-surface to adjacent air-volume; the cooled air slides down the slopes and accumulates in the valley bottom; the enclosing hills protect the valley from the winds, and therefore the cooling by contact with and radiation to the ground continues in the same mass of air and reduces it to a still lower temperature. But around a mountain, in spite of the low temperature to which it falls, the air-thermometer shows but little cooling, for the contact surface is relatively small; the wind continually brings new air to be cooled; or if the night be calm, the air that is cooled by contact rolls down the slopes and is replaced by uncooled air. Hence air in valleys has a greater diurnal temperature range than around mountains; the valley air may be even colder than that on the hills at night.

These two conclusions may be condensed into the statement that convex masses have a greater diurnal range than concave masses. The mountain rocks vary most; next, the valley ground; then, the valley air; and the mountain air the least. The following extracts illustrate a number of the foregoing statements:—

Place.	Altitude.	AIR IN SHADE.		GROUND.		
		Mean.	Mean Max.	Mean.	Mean Max.	
Faulhorn, Switzerland	2,680 m.	6.7	9	9.5	19.5	Martins, 9 days in Aug., 1842. (Centigrade scale.)
		AIR.		GROUND.		
		Mean.	Abs. Max.	Mean.	Abs. Max.	
Pic du Midi, Pyrenees	2,877 m.	10.1	13.2	33.8	52.8	Martins, 8 days in Sept., 1864.
Bagnères, S. France .	551 m.	22.8	27.1	86.1	50.3	

Hann quotes the mean centigrade ratio for plateaus, as follows :—

For the Deccan, India (Schlagintweit) . . . . 0.43

For Würtemberg (Schoder), about . . . . 0.50

For general continental masses . . . . 0.4 to 0.5

The altitude of a mean temperature of freezing ( $0^{\circ}$  C. =  $32^{\circ}$  F.) for the ground and the air is given thus :—

	Ground.	Air.	
For the Alps in general,	2,800–2,900 m.		Schlagintweit.
For St. Gothard . . .	2,775 m.		Stapff.
For eastern Alps . . .		1,950–2,150 m.	Hann.

Observations of this character are much needed in our mountain regions.

An interesting consequence of the increase of the diurnal variation with the decrease of the mean ground temperature is that there must be a certain altitude in every mountain range where the change from freezing to thawing is most frequent, and where, consequently, the most rapid weathering away of the mountain by this cause will be found. Such a question as this deserves early investigation in our mountains.

Mousson first suggested this, and was followed by Heim.

Rodler has lately published a paper, "Die verticale Vertheilung der Temperaturschwankungen um den Frostpunkt in der Schweiz" (Zeitschr. für Meteorol., 1885, xx. 4–8), on this subject, but unfortunately had only air temperatures for his discussion; for these the altitude referred to is from 1,200 to 1,400 metres. For ground-temperatures the altitude would doubtless be greater.



*Inversion of Temperature.* — There are times when the air is actually warmer aloft or on mountain tops than below. At such times the temperature variation with the height is said to be abnormal, or inverted. The simplest case is that of the air over a desert plain on a clear, calm night; the ground cools fast by radiation, and thereby chills the air next to it, while the open air at a little height cools less, and may thus be warmer than that below it. Hence dew forms on the ground, not in the air; and frosts often blight the lower and not the higher branches of a bush. The inversion is increased by the nocturnal air-drainage down valley-slopes, already mentioned, so that mountain countries are particularly subject to inverted temperatures. While in Montana, a few years ago, returning to camp late one night, I followed the trail over several sharp ridges and across the deep, intervening ravines, and found the effect of air-drainage very well marked. The quiet valley air was raw, chilly, and penetrating, while the faint breezes over the ridges brought a soft warmth that recalled the high temperature of the afternoon.

During winter the inversion is still further intensified; for the duration of sunshine, always relatively short in valleys, is then still more shortened, and the ratio of insolation to unbalanced nocturnal radiation is greatly diminished. The lowest air in the valleys is thus, for several reasons, often colder than that above it. The Swiss seem to have discovered this, and frequently build their villages on inconvenient sloping hillsides instead of on the level flood plain in the valley bottom. In certain parts of the eastern Alps the inversion of temperature appears even in the normal winter mean, and must therefore be recognized as a regular climatic factor, and not simply as a temporary and abnormal occurrence.

Hann's detailed monograph on "*Die Temperaturverhältnisse der oesterr. Alpenländer*," already quoted, is authority for this statement (page 89). The inversion appears best in well-enclosed valleys, where the air stagnates, and is not replaced by air from above, which, as will be shown further on, would be much warmer. The following example for the Pusterthal will illustrate the case. Brunneck, in the

bottom of the valley, is here seen to be coldest in winter and warmest in summer.

	Altitude.	January.	Winter.	July.	Ann Var.
Brunneck . .	825 m.	— 6°.8 C.	— 5.0	18.1	24.9
Steinhaus . .	1,050	— 5°.8	— 4.5	15.9	21.7
St. Peter . .	1,360	— 4°.6	— 3.7	14.7	19.3
Prettau . . .	1,440	— 5°.6	— 4.5	13.1	18.7

But the most extraordinary contrasts between warmth on mountains and cold in valleys appears during the passage of an area of high pressure in winter, when we have a spell of "anticyclonic" weather. At such times the air is known to be slowly descending from aloft; for occasional high-level clouds are seen to converge towards the centre of high pressure, while the surface winds move slowly outward from it. The descent of the air brings it under greater pressure; it is compressed and thereby warmed; hence the abnormal warmth felt during such weather on mountains. Sometimes, indeed, it even grows warmer at high stations during the night, in clear, calm, anticyclonic weather; therefore the warmth cannot be ascribed to sunshine, as some writers have suggested. The extreme dryness of such a time is further evidence of descending motion in the air, for the upper atmosphere contains very little vapor. Now, just while the mountain tops feel the warmth of the descending air, the valleys are abnormally cold. Evidently we must not look to the upper air as a source of this cold; for in that case the mountains should be colder, not warmer, than the valleys. The cold of the ground and of the air next to it is in spite of, and not on account of, the descent of the upper air; it results from the rapid radiation into the clear, dry anticyclonic sky. The lower air lies almost stagnant at such times, and its temperature falls very low. The quiet and excessive cold of the lower levels engenders fogs; and thus we have one of the most peculiar inversions of weather conditions. It is ordinarily the mountain peaks that are chilly and cloudy, while the valleys are warmer and clear; but in the anticyclones of winter the lowlands often are cold and sunless beneath a heavy fog mantle, while the mountain tops are absolutely warmer, and rise into brilliantly clear air over a sea of clouds.

Espy was deeply impressed with the importance of changes of air temperature produced in ascending or descending currents. He was decidedly in advance of his time in the application of this principle to meteorological processes. The committee of the French Academy — Arago, Pouillet, and Babinet — appointed to report on Espy's theories, said: "Finally, it is proved by the investigations of Mr. Espy that we should not hereafter adduce in the mean state of the atmosphere a descending current of air as a cause of cold" (*Comptes Rendus*, 1841, xii. 461, and quoted in Espy's "Philosophy of Storms," 1841, p. xxxviii). In spite of these early definite statements, it has taken many years to bring Espy's views into the prominence that they deserve.

In the foregoing explanation of the temperature inversion in anticyclones, I have followed Dr. Hann, who first gave a satisfactory discussion of this important question. His earliest detailed article is "Ueber das Luftdruck-Maximum vom 23 Jänner bis 3 Februar, 1876, nebst Bemerkungen über die Luftdruck-Maxima in Allgemeinen" (*Zeitschr. für Meteorol.*, 1876, xi. 129-135). It is here said that the warmth on mountains in anticyclones is distinctly abnormal, and is not simply a contrast with cooled lower air accumulated in the valleys by drainage; it must have a definite source, and this is most naturally found in the descent of air from above. At a moderate elevation above the earth's surface the descent must change to a horizontal motion; and in this part of its path the air is cooled by the low temperature of the ground, where radiation is favored by the clearness and dryness of the upper air. The strong cooling produces heavy ground fogs, which fill the depressions at such times.

December, 1879, witnessed an occurrence of high pressure over southern and central Europe that was extraordinary for its intensity and duration, and for the violent inversions of temperature that it produced. It excited much attention in the meteorological journals and reports. Dr. Hann wrote on "Die Temperaturverhältnisse des December, 1879" (*Zeitschr. für Meteorol.*, 1880, xv. 76-81), making a comparison of the temperatures at Klagenfurth (valley) and Hochobir (mountain), the latter 5,215 feet above the former. He found that from December 16 to 28 it was continually warmer on the mountain than in the valley. At 7 A. M. the mean difference for these thirteen days was 23°.4 F. in favor of the mountain; at 2 P. M., 21°.2; at 9 P. M., 19°.6. The greatest difference was early in the morning, because at that time the lower air had cooled more than the upper. Billwiller, director of the Swiss weather service, follows Hann in his explanation, and finds that the above differences of temperature were

characteristic of a number of valleys and mountains in Switzerland during the period mentioned (*Zeitschr. für Meteorol.*, 1880, xv. 82-85). Colonel Ward ascended Mt. Croy (6,792') in Valais, Switzerland, on Christmas Day, and found the air of extraordinary transparence, the view extending to the Vosges and the Black Forest; at the same time a heavy cloud covered Lakes Geneva, Neuchâtel, Morat, and Bienne, and filled the adjacent valleys to an elevation of about 4,400'. The upper surface of the cloud was smooth, like a sea of milk (*Arch. des Sciences*, 1880, iii. 68). Angot describes similar conditions for France, and illustrates the pressures and temperatures over the whole of Europe in two maps of great interest; but he attributes the whole effect to surface cooling, and does not recognize the abnormal warmth on his mountain stations (*Ann. Bureau centr. météorol. de France*, 1879, p. 19, cartes 12, 24). Plumandon furnishes an illustration of the view from the Puy de Dôme when all the adjacent low country was covered with clouds, above which only the summits of the neighboring volcanoes could be seen ("La France centrale sous les nuages," *La Nature*, 1884, i. 164).

A later example described by Hann occurred about New Year's, 1882. The inversions of temperature were well marked, but a point of especial interest was the appearance of local and occasional warm, dry winds on the lowlands. So long as the air lay calm, it was cold; when a wind sprang up, it became warmer directly (*Zeitschr. für Meteorol.*, 1882, xvii. 48-52). This evidently means that the descent of the air was more rapid at times when wind was felt, and then there was not time to cool the air very much by radiation. We shall meet this principle again in describing the Foehn wind.

Woeikoff finds evidence of a persistent inversion of temperatures in far Siberia, the winter cold-pole of the Eurasian continent. The pressure is very high during the winter, and the surface temperatures are excessively low; the records from a few mountain stations—such as Mt. Alibert, famous for its graphite mines—show a less immoderate cold (*Zeitschr. für Meteorol.*, 1883, xviii. 246).

Buchan's reductions of the observations on Ben Nevis, in the "*Journal of the Scottish Meteorological Society*," 1884, p. 8, furnish striking illustrations of the same conditions. On Dec. 31, 1883, when the barometer read 29".515,—the highest reading ever made on the Ben,—the temperature was 4°.5 higher than Fort William, the sea-level station at the foot of the mountain.

Inversions of temperature on Mt. Washington are of common occurrence. A striking example was pointed out by Professor Upton for the morning of Dec. 27, 1884. The pressure was high and the wind

everywhere light; the temperature on the mountain top was  $+16^{\circ}$ , while the low-level stations north of Massachusetts ranged from  $-10^{\circ}$  to  $-24^{\circ}$  (Bull. 2, N. Engl. Meteorol. Soc.). The Signal Service daily weather maps not infrequently show a similar but less marked inversion during anticyclones; for example, Dec. 16, 1873, and Jan. 18, 1874. Inverted temperatures on Mt. Washington when it stands a little north or northeast of a centre of low pressure will be referred to under the description of mountain winds.

Pike's Peak is too high to show the inversion very frequently; but Professor Loomis tabulates thirty-nine examples of it in the course of four years, and finds them all in the winter months. The most extreme examples show the Peak (14,134') to be even fifteen and sixteen degrees warmer than Denver (5,294'). The relation of these inversions to areas of high pressure is not stated, but the winds at Denver averaged only four miles an hour, which points to such a condition (Amer. Journ. Sc., 1880, xx. 10).

In a second paper the effect of mountains on winds, clouds, and rain will be considered.

---

### Report of the Recording Secretary for 1885.

DURING the past year the increase in the corporate membership has been much larger than in 1884, though less than in the years 1880, 1881, and 1883; the losses amounting to 59, and the new members numbering 180, the net gain has been 71. No change has taken place in the list of Honorary Members. Among the Corresponding Members we notice the accession of Mr. Henry Gannett and Miss Lucy Larcom, and the death of Professor W. C. Kerr. For the first time in our history we notice the death of a Life Member, Hon. Elizur Wright. The Honorary, Corresponding, and Life Members now number, respectively, 10, 40, and 23; and the total membership of the Club is 693.

There have been held nine regular, two special, and two field meetings, — thirteen in all; the average attendance upon which has been over one hundred. There were presented at

these meetings five reports of Councillors and twenty-five papers. Twelve papers treated some section of the White Mountains, and six were illustrated with the lantern.

The field meetings were held at the Flume House, N. H., and at Mt. Mansfield, Vt. Excursions were made to Rattlesnake Hill, in Quincy; Manomet Hill, in Plymouth; Ship Rock and Bartholomew's Pond, in Peabody; to Lincoln; Mts. Cardigan and Kearsarge (South); Mt. Desert; Moose Hill, in Sharon; and Red Hill, in New Hampshire. In connection with the field meetings many excursions were made, including ascents of Kinsman (North and South), Lafayette, Lincoln, Liberty, and Flume, in New Hampshire; and Mt. Mansfield, in Vermont. After the Vermont field meeting, parties visited Lake George and the Ausable Chasm.

The annual reception was held, February 13, at the Revere House, and was largely attended.

Vol. IV. No. 2 of APPALACHIA was issued in July.

We continue to enjoy the valuable privileges granted us by the Massachusetts Institute of Technology.

Through the generosity of many members of the Club we have raised a sum of money sufficient to cover the running expenses of a Club-room; and an efficient committee, of which the President is chairman, has selected a room at No. 7 Park Street, and prepared it to meet the needs of the Club. Not only are members afforded easy access to the books and maps of the Library, but a convenient room is secured for committee and council meetings.

It gives me great pleasure to say that the Club is in a flourishing condition, and that its efforts are appreciated not only by mountain-lovers, but by the general public.

Respectfully submitted,

ROSEWELL B. LAWRENCE,  
*Recording Secretary.*

**Annual Report of the Corresponding Secretary for 1885.**

DURING the past year the pleasant relations existing between our Club and societies of similar aims abroad have continued. Naturally, our intercourse has not been very intimate, but enough has occurred on either part to exhibit the interest mutually felt. Of the 80 communications received by the Corresponding Secretary during the year, more than one fourth have been from foreign Alpine clubs, as follows: From the Club Alpino Italiano, 6; the Schweizer Alpen Club, 4; the Società degli Alpinisti Tridentini, 5; the Oesterreichischer Touristen-Club, and Club Alpin Français, 2 each; the Deutscher und Oesterreichischer Alpenverein, and Magyarországi Karpát-Egyesület, 1 each.

Very early in the year an occasion offered for the Club to respond to a call to aid in a great charitable work undertaken by the Italian Alpine Club. It was found no difficult matter for our Committee to raise a subscription of upwards of \$220 for the sufferers by the avalanches in Northern Italy, which was duly forwarded, and acknowledged with fervid gratitude. Certain other calls, seemingly less pressing, have also been received; but it has not been thought best to appeal to the Club in behalf of their objects.

Two notable conventions were held in Europe during the summer,—one of the Deutscher und Oesterreichischer Alpenverein at Villach in Carinthia, the other the International Congress held in Turin under the auspices of the Club Alpino Italiano. Our fellow-member, Mr. Lucius L. Hubbard, now residing in Bonn, author of the “Woods and Lakes of Maine,” was chosen to represent the Club at both these gatherings. The former he attended, and was received as an honored guest; but the fatality which has rendered futile our efforts for the past two years to secure a representation at the general Congress again intervened,—the notification was not received until the event was past. Our good intentions, however, were not lost sight of; for Mr. Hubbard’s name, sent in advance to

the Turin Committee, appears in the printed list of those taking part in the Congress.

Three new corresponding societies have been added to our list during the year, — one, the Magyarországi Karpát-Egyesület (Hungarian Carpathian Club), in response to our invitation; the other two, the Scottish Geographical Society and the Thüringerwald-Verein, at their request. The last-mentioned society courteously sent to the Appalachian Club a complimentary ticket of membership.

In the last report of the Corresponding Secretary, mention was made of the failure to receive any reply to a request made to the English Alpine Club for an exchange of publications. A polite answer regretfully declining, on account of the small edition of the "Alpine Journal" printed, came to hand a few days after that report was made.

Our own library, which is under the charge of the Corresponding Secretary, has received rather more accessions than last year, from the same sources as heretofore. Of the 130 volumes, in 388 parts, that have been received, 40 were in exchange from home societies, 24 from foreign Alpine clubs, 19 from the geographical societies, 5 from other exchanges, and 86 by donation. Of these donations, 7 were from their authors, who are also members of the Club. Several maps have also been added to our collection, principally by a donation from Mr. H. Gannett, Chief Geographer of the United States Geological Survey, our new corresponding member.

The library is a subject of more than usual importance at the present time. Within a few weeks it has been transferred from the Museum of the Society of Natural History, where for some years it has enjoyed a generous hospitality, to the new quarters of the Club, where for the first time it may be regarded as at home. The librarian has not ceased to wonder at the miracle whereby nearly all the shelves that had been provided — much more than twice the space that the library had occupied before its removal — have suddenly presented an almost solid front of books. The former doubled ranks are now displayed in one; and unless we resort anew to the old expedient for economical though most inconvenient storage, we shall shortly be compelled to add other shelves.



The present time is most fitting to consider what our aim should be in forming a library. It goes without saying that there is no call for the Club to make a miscellaneous collection of books. Our library should be of a special or departmental character. The broadest field within which we might consider ourselves as justified in gleaning would be the outdoor world; but, in my opinion, we should in general make no effort to increase our collection in departments where books are already easily accessible in other libraries. The mountain and what pertains to it, primarily, and then geography as a branch of human knowledge, seem to me to afford a sufficient scope for useful effort for the Club as a collector of books.

In the absence of a geographical society in Boston, there is manifestly an opportunity for us to do a good work in collecting maps and charts. A good beginning has already been made in this direction. Hitherto our possessions in this kind have been out of reach, and almost wholly unknown to us. As with our books, a similar surprise attended the transfer of our maps from the case at the Institute of Technology to the fine new cabinet that graces our Club-room. In certain departments we have a considerable collection, particularly of maps of the Government Surveys in the Western States and Territories, and of Coast Survey Charts. But much remains to be done. Special effort should be made to secure copies of the older maps of our country, especially of New England, and special sectional maps, as they are published by surveys or individuals; certainly, a good wall-map of New Hampshire should hang where it can easily be consulted. It is the purpose of the librarian to classify the present collection, and arrange them in special card-board folios on the shelves of the cabinet, with a catalogue and indexes to facilitate reference to them.

Now that our library is practically open to members of the Club at all times, it seems proper to do away with the plan of sending certain periodicals to those who are especially interested. This will be the easier, as only a few have ever availed themselves of it.

A list of the accessions of the past year is appended to this

report. The names of members, donors of their own works, are in italics. The thanks of the Club are also due to Colonel C. W. Folsom for donations during the past year. The present number of volumes in the library is about 780.

Respectfully submitted,

CHARLES E. FAY,

*Corresponding Secretary.*

FROM CORRESPONDING SOCIETIES.

*American.*

*California Academy of Sciences.* — Bulletin, 1885, 2, 3.

*Cambridge Entomological Club.* — *Psyche*, Vol. IV. 126-134.

*Essex Institute.* — Bulletin, Vol. VII. 1-3; Vol. XV. 11, 12; Vol. XVI. 7-12.

*Geological and Natural History Survey of Canada.* — Reports 1882-84, with maps; Catalogue of Canadian Plants; Comparative Vocabulary of the Indian tribes of British Columbia; Descriptive Sketch of the Physical Geography and Geology of the Dominion of Canada.

*Geological and Natural History Survey of Minnesota.* — Reports, Vols. I., XI., XII.

*New Hampshire Historical Society.* — Proceedings, 1876-84.

*New York State Survey.* — Report of 1884.

*Smithsonian Institution.* — Annual Report 1863, 1869, 1879, 1881-83.

*Torrey Botanical Club.* — Bulletin, Vol. X. 1-3, 12; Vol. XII. 1-11.

*United States Geological Survey.* — Monograph, III. and Atlas; Bulletin, 2-14; Survey of the Territories, Vol. VIII.; Maps of Territories, 1-10.

*United States War Department.* — Professional Papers, Vol. XIV.; Report of Chief Signal Officer for 1884.

*Foreign.*

*Associació d' Excursions Catalana.* — Butlletí, Any VII. 73-86.

*Club Alpin Belge.* — Bulletin, Nos. 1-5, 7.

*Club Alpin Français.* — (*Direction Centrale*) Bulletin, 1884, 7; 1885, 1-6. Annuaire, 1883. (*Section du Sud-Ouest*) Bulletin, Nos. 16, 17.

*Club Alpino Italiano.* — (*Direzione Centrale*) Rivista, Vol. III. 12; Vol. IV. 1-11; Bollettino, Vol. VII.; Bilancio, Relazione del Presidente sec. 1884; Natale Strenna (1884). (*Sezione Fiorentina*) Regolamento. (*Sezione di Vicenza*) Bollettino, VII.; VIII. 1-5; Panorama dell' altipiano dei Sette Comuni.

*Club Alpin Suisse.* — (*Comité Central*) Beilagen zum Jahrbuch, Bd. XX. (*Section Genevoise*) L'Echo des Alpes, 1884, 2; 1885, 1-3.

*Deutscher und Oesterreichischer Alpenverein.* — Mittheilungen, 1883, 1-7; 1884, 1-10; Zeitschrift, Bd. XV. 1-3.

*Den Norske Turistforening.* — Årbog, 1884.

*Oesterreichischer Alpen Club.* — Oesterreichische Alpen-Zeitung.

*Oesterreichischer Touristen-Club.* — *Oesterreichische Touristen-Zeitung*, Bd. IV. 14; Bd. V. 3-12, 14-21, 23, 24; *Chronik*, 1884.

*Thüringerwald-Verein.* — *Beiträge zur Landes- und Volkskunde des Thüringerwalds*, Heft I.; *Zur Anregung werththätiger Theilnahme an der Erforschung des Thüringerwalds und seiner Bewohner*; *Die Touristen-Vereine der Gegenwart*, von R. Köhler.

*Geographische Gesellschaft zu Greifswald.* — *Jahresbericht*, 1883-84, II.

*Gesellschaft für Erdkunde* (Berlin). — *Verhandlungen*, Bd. XI. 6-10; Bd. XII. 1-8.

*Imp. Russkoye Geographicheskoye Obshtchestvo.* — *Izvestiya*, XX. 6; XXI. 1-5; *Otchet*, 1884.

*Kais-Königliche Geographische Gesellschaft.* — *Mittheilungen*, Bd. XXVII.

*Nederlandsch Aardrijkskundig Genootschap.* — *Tijdschrift* II. Ser. II. Deel. No. 1-8.

*Royal Geographical Society.* — *Proceedings*, Vol. VII. 1-12.

*Scottish Geographical Society.* — *Magazine*, Vol. I. 1-12.

*Sociedad Geografica* (Madrid). — *Boletin*, Tomo XVII. 4, 6; XVIII. 1-6; XIX. 1-4.

*Sociedade de Geographia* (Lisbon). — *Boletim*, 4<sup>a</sup> Ser. 10, 11; 5<sup>a</sup> Ser. 1-5;

*Risposta á Sociedade Ante-Escavista de Londres*; *Subsidios para a Historia do Jornalismo nas provincias ultramarinas portuguezas*.

*Società Geografica Italiana.* — *Bollettino*, Vol. X. 1-11.

*Société de Géographie Commerciale de Bordeaux.* — *Bulletin*, Vol. VII. 2<sup>d</sup> Sér. 1-15, 17-24; *Congrès National des Sociétés Françaises de Géographie*, V. Session.

*Société Royale de Géographie d'Anvers.* — *Bulletin*, Vol. IX. 4-6; Vol. X. 1-3.

*Société Khédiviale de Géographie.* — *Bulletin*, Vol. II. Sér. 5-7.

#### FROM EXCHANGES.

*Outing*, Vols. I., II.; Vol. III. 1, 2, 5; Vol. IV. 1, 6; Vol. V. 5; Vol. VI.; Vol. VII. 1-4.

*Revue Géographique Internationale*, Nos. 110-120.

#### DONATIONS.

*Abstract of the Proceedings of the Society of Arts, Massachusetts Institute of Technology*, for the twenty-third year, 1885.

*Along Alaska's Great River.* F. Schwatka.

*Analysis of the Route from Philadelphia to the Mouth of the Kansas River in Kansas Territory.*

*Appalachia*, Vol. II. No. 2.

*Boletin del Ministerio del Fomento*, Tomo X. Nos. 43-54.

*Bulletin of the Des Moines Academy of Sciences*, Vol. I. No. 1.

*Bulletin of the Washburn College Laboratory of Natural History*, Vol. I. No. 4.

*Capon Springs and Baths.*

- Description of Banvard's Panorama of the Mississippi River.  
 Disturnell's Northern Traveller.  
 Geological Sketches of the Precious Metal Deposits of the Western  
 United States. *S. F. Emmons* and *G. F. Becker*.  
 Guide Book for Mount Desert. *Clara B. Martin*.  
 Guide to West Point.  
 Hawaiian Almanac for 1867, No. 1.  
 In Montagna.  
 Indian Bulletin for 1867, No. 1.  
 Iowa Handbook for 1857.  
 Kansas and Nebraska Handbook for 1857-58.  
 L'Alpinismo in Italia. *Paolo Livi*.  
 La Vedetta, Anno XXV. Nos. 250-254.  
 Le Piccole Industrie del Vicentino. *A. Cita*.  
 Les Alpes du Dauphiné. *E. Debriges*.  
 On the Superficial Deposits and Glaciation of the District in the Vicinity  
 of the Bow and Belly Rivers. *G. M. Dawson*.  
 Ortler-Führer. *J. Meurer*.  
 Practical System of Modern Geography. *J. Olney*.  
 Report of the Different Routes and Estimates for the Sackett's Harbor  
 and Saratoga Railroad.  
 The Alpine Club of Williamstown, Mass. *S. H. Scudder*.  
 The Boston Committee's Tour in Canada.  
 The Hoosier Naturalist, Vol. I. No. 5.  
 The Mineral Springs of Virginia.  
 The Minnesota Handbook for 1856-57.  
 The Plymouth County Hills. *C. E. Ridler*.  
 Universal Geography. *Woodbridge and Willard*.  
 Valle Bavona. *F. Balli*.  
 West-Tirol Führer. *J. Meurer*.  
 What Northern Men say of North Carolina.  
 Woods and Lakes of Maine. *L. L. Hubbard*.  
 Worcester's Geography (Ancient); (Modern).

### Treasurer's Report for 1885.

#### RECEIPTS FOR THE YEAR ENDING DEC. 31, 1885.

Balance on hand, Dec. 31, 1884 . . . . .	\$956.50
Admission fees from 125 new members . . . . .	\$375.00
Assessments from 23 members for 1884.	
"    "    404    "    "    1885.	
"    "    4    "    "    1886.	
Total . . 431 at \$3 . . . . .	1,293.00
Amounts carried forward . . . . .	\$1,668.00
	\$956.50

<i>Amounts brought forward</i> . . . . .	\$1,668.00	\$956.50
Life-Memberships: Elisha M. White and James M. Gleason . . . . .	60.00	
Sales of APPALACHIA . . . . .	113.19	
Donations:		
For Carter-Moriah Path . . . . .	\$51.00	
" Map of White Mountains . . . . .	25.00	
" A. M. C. Room . . . . .	458.50	
	<hr/>	534.50
Balance returned by Committee on Annual Reception . . . . .	.45	
Balance returned by Committee on Field Meetings and Excursions . . . . .	70.73	
Interest on investments . . . . .	61.09	
	<hr/>	2,507.96
		<hr/>
		<u>\$3,464.46</u>

## PAYMENTS FOR THE YEAR ENDING DEC. 31, 1885.

Postage and stationery . . . . .	\$168.10	
Printing and advertising . . . . .	195.17	
Clerical services . . . . .	106.00	
Expenses of meetings . . . . .	53.06	
APPALACHIA:		
Balance on Vol. IV. No. 1 . . . . .	\$14.27	
Vol. IV. No. 2 . . . . .	287.10	
Delivery, postage, etc. . . . .	59.94	
	<hr/>	361.31
Permanent Fund, deposited in Suffolk Savings Bank . . . . .	86.48	
Donation in aid of sufferers by avalanches in Piedmont . . . . .	25.00	
Department of Topography, for work on White Mountain map . . . . .	229.00	
Department of Improvements, for work on Carter-Moriah Path . . . . .	102.00	
A. M. C. Library . . . . .	72.50	
A. M. C. Room, Park St., furniture, fixtures, etc. . . . .	284.17	
	<hr/>	\$1,682.79
Balance on hand, Dec. 31, 1885 . . . . .	1,781.67	
	<hr/>	<u>\$3,464.46</u>

There is also on hand, belonging to the Permanent Fund, \$841.62, being \$690 received from 23 Life-Members at \$30 each, and \$151.62 received for interest. This is deposited in the Suffolk Savings Bank.

GARDNER M. JONES, *Treasurer.*

# TREASURER'S REPORT.

253

Boston, Jan. 8, 1886.

The undersigned have examined the accounts of Gardner M. Jones, Treasurer of the Appalachian Mountain Club, for the year 1885, and find them properly kept and correctly balanced, with satisfactory vouchers for all payments.

The assets of the Club are —

Permanent Fund . . . . . \$841.62

Cash in hands of Treasurer . . . . . 1,781.67

EUGENE B. HAGAR,  
CLARA B. MARTIN, } Auditors.  
CHAS. W. KENNARD,

## STATEMENT OF RECEIPTS FOR FIRST TEN YEARS.

YEAR.	MEMBERSHIPS.					Sales of APPALACHIA.	Interest.	Donations.	Life Memberships.	Annual Reception.	Field Meetings and Excursions.	Club Room.	Total.
	Admission Fees.	Yearly Assessments.	Back Assessments.	Advance Assessments.	Total.								
1876	252.00	....	....	....	252.00	43.00	....	....	....	....	....	....	296.00
1877	52.00	248.00	12.00	....	312.00	98.00	....	....	....	....	....	....	410.00
1878	76.00	226.00	16.00	....	318.00	76.00	....	43.00	60.00	....	....	....	497.00
1879	148.00	260.00	40.00	....	448.00	130.00	....	2.00	222.00	....	....	....	802.00
1880	178.00	336.00	24.00	....	538.00	117.00	11.00	86.00	90.00	....	....	....	842.00
1881	222.00	384.00	18.00	12.00	636.00	141.00	17.59	62.55	120.00	....	....	....	977.04
1882	256.00	528.00	74.00	....	858.00	309.43	22.07	2.00	90.00	....	....	....	1281.50
1883	395.00	1000.00	20.00	27.00	1442.00	197.58	39.72	22.00	210.00	9.72	82.88	....	2003.90
1884	285.00	1059.00	21.00	9.00	1374.00	93.51	53.29	1.00	60.00	26.80	11.47	....	1620.07
1885	375.00	1212.00	69.00	12.00	1668.00	113.19	61.09	76.00	60.00	.45	70.73	458.50	2507.96
Total	2239.00	5253.00	294.00	60.00	7846.00	1313.71	206.76	514.55	690.00	36.97	165.08	458.50	11236.47

## STATEMENT OF EXPENDITURES FOR FIRST TEN YEARS.

YEAR.	Permanent Fund.	Postage, Stationery, etc.	Miscellaneous Printing.	APPALACHIA.	Topographical Department.	Art Department.	Improvements and Exploration.	Clerical Expenses.	Expenses of Meetings.	Library.	Club Room.	Donations.	Total.
1876	....	36.00	74.00	141.00	....	....	15.00	....	....	....	....	....	266.00
1877	....	39.00	84.00	364.00	....	13.00	....	....	....	....	....	....	500.00
1878	....	84.00	161.00	200.00	2.00	53.00	20.00	....	....	....	....	....	520.00
1879	60.00	66.00	96.00	240.00	19.00	....	159.00	....	....	....	....	....	612.00
1880	90.00	77.00	109.00	290.00	19.00	....	73.00	....	....	....	....	....	686.00
1881	120.00	199.22	194.87	246.23	37.95	....	68.00	19.75	22.70	....	....	....	908.72
1882	90.00	143.59	115.40	675.93	25.40	....	....	34.50	25.00	....	....	....	1109.82
1883	281.72	190.18	199.55	396.27	23.65	....	160.37	67.41	1.38	69.78	....	....	1360.31
1884	113.42	181.46	201.03	1176.53	....	....	21.00	57.62	....	58.10	....	....	1809.16
1885	86.48	168.10	195.17	361.31	229.00	....	102.00	106.00	53.06	72.50	234.17	25.00	1682.79
Total	841.62	1184.65	1430.02	4061.27	356.00	66.00	618.37	285.28	102.14	200.88	234.17	25.00	9454.80

**Reports of the Councillors for the Autumn of 1885.****Natural History.****BY GEORGE C. MANN.**

THE Councillor of the Department of Natural History presents but a meagre report for his year of office.

The town of Littleton, N. H., in preparing a town history, has requested the co-operation of the members of the Club in the collection of data for a chapter on the flora and fauna of that region. Any suggestions or any facts bearing upon this subject may be communicated to Rev. M. V. B. Knox, Littleton, N. H.

The land-slides of 1885 on the northern side of Cherry Mountain and upon Tripyramid have aroused interest in the study of land-slides in general,—their causes, phenomena, and effects. They present a striking and picturesque illustration of geologic change, and at the same time afford an opportunity for the study of rock and earth formation beneath the ordinary surface of the ground, which is unique. It is to be wished that some comparative observations of land-slides might be made at this present favorable opportunity.

A paper on the slide on Cherry Mountain is appended, and another upon the slide of Tripyramid will be found in the present number of APPALACHIA.

---

**NOTES ON THE SLIDE AT JEFFERSON, N. H. BY M. V. B. KNOX.**

THIS slide, as generally known, occurred on the north side of Cherry Mountain, from a jutting crest called Owl's Head. On August 3 I visited the scene, and went to the top of the slide, taking ample time to study its starting-point as well as its course to the open fields. At the very beginning, a dozen rods below the top of Owl's Head, lies a great mass of the mountain ledge, fifty by fifteen feet. It was beside this, on the east, that the slide started. Some claim<sup>1</sup> that a section of this rock gave the first impulse to the slide; but the east face of this mass is weather-worn, and ferns grow in the crevices, so that if any great piece had lain there,

<sup>1</sup> See Science, vi. 85.

it must have been at some distance from that now remaining. I could detect no abrasion of the underlying rock, which for the first twenty feet was laid bare; and this must have occurred had so great a mass of rock slid over it. As far as I could see, the soil now remaining beside this great rock held only the usual matter of such mountain dirt,—rotten roots, blocks of rock, leaf-mould, and the coarse gravel of the disintegrated, underlying syenite. The hill-top had once been burnt over; and the course of the slide for the first fifty feet or more was where this had occurred. Then the full growth of green timber began. The remaining soil, at the edge, showed no sign of any great rock having been embedded in it.

The width of the slide for the first twenty feet is about fifteen feet, widening gradually to twenty feet or more at the distance of fifty feet down; and then, as the edge of the green timber is reached, the width suddenly becomes sixty or a hundred feet wide. It occurred to me that the start may have been from the wide section of green timber below the burnt spot, the portion of the latter which descended being only a little that slipped down after the supporting mass below had left it; or it might have been dragged after by the downward movement of the mass below. It may be, however, that the burnt spot, owing to the roots being rotten, and so lacking the support arising from cohesion of its mass, was the starting cause. It did not seem, however, that so small a lot of moving earth could have started the wide and deep mass that was carried from the space below in the green timber. It would be an interesting fact if the cause of so many slides now-a-days in these mountains could be ascertained. It is certain that they are more common than formerly.

The angle of the rock on which this slide started is not more than twenty degrees from the horizontal, and, while a little steeper at some places, does not much exceed this grade, and becomes less as it enters the ravine, five hundred yards down. A little water was trickling over the rock from the very start, which gradually increased so as to make a very small brooklet before the ravine was reached. On each side of this ravine the ground is springy, so that the volume becomes a considerable brook by the time it passes Stanley's house.

The *débris* of the slide—broken trees, mud, rocks, and the rest—was mostly carried to the foot of the mountain, and deposited on the Stanley farm. There was more mud than boulders in it; and the mortar-like consistency of the mud is shown by its being now hardened almost like a macadamized road. The boulders and logs in the after part of the *avalanche*, which were left behind, are all covered with this mud on the upper side, showing that a flood of mud followed the first mass that swept down the track. The ravine and track at the bottom of the course were sometimes as much as sixty feet below the highest deposit of the *débris*, while it was often thrown much higher on one side than on the other, owing to the sinuosity of the ravine.



In some places the water-course has worn deep into the soil since the slide, showing gravel and fragments of rocks in position to the depth of several feet, — showing, also, by the packed condition, that doubtless this same ravine had, in some remote times, been the track of similar slides. The rocky side of the mountain is not laid bare more than half the way in the track of the slide. Yet the force of the slide was very great, carrying out on Stanley's farm boulders a dozen feet in diameter. Some of the trees left standing are split in two at the base, while one large birch had part of its top carried away sixty feet or more from the ground.

---

## **Reports of the Councillors for the Autumn of 1885.**

### **Topography.**

By A. E. BURTON.

DURING the past year the efforts of the Department of Topography have been mainly directed towards the completion of a manuscript map of the White Mountains, on a scale of  $\frac{1}{50000}$ , from data already collected by members of the Club.

A draughtsman has been hired and kept steadily at work the past summer, simply plotting the horizontal angles; and now, thanks to the kindness and assistance of our Vice-President, the Department is able to make a report of very satisfactory progress. It was hoped that the completed map might be shown at this time; but to have hurried the work to completion would simply have been to lessen the value of the result.

The revision of the old map of the vicinity of Boston was not attempted as proposed, owing to some unforeseen difficulties in re-engraving.

---

## **Reports of the Councillors for the Autumn of 1885.**

### **Exploration.**

By E. B. COOK.

THE Councillor of Exploration has the honor of submitting a short report upon what has been done in his department

during the present year. In his spring report the writer stated that he should probably during the summer visit the Pilot Range, the second of the thirteen districts into which Mr. De Pourtalès divided the regions in which exploration was especially desirable. Upon the 6th and 7th of August a party consisting of Mr. W. H. Peek, Mr. George A. Sargent, Mr. Hubbard Hunt, and myself, traversed the Pilot Range from south of "Cape Horn" to over the highest peak of the range, in the township of Kilkenny. An account of this excursion will be found on another page, as well as a comprehensive paper upon the slides on Tripyramid Mountain by the Rev. A. A. Butler, of New York. During the summer the writer, among other walks, passed over Mts. Nancy, Anderson, and Lowell, in sequence, and ascended Round Mountain, adjoining or belonging to the Pliny Range, and herewith sends accounts of these excursions. During the year exploration has received consideration in many entertaining papers that have been read before the Club.

In conclusion, let me give an interesting instance of how exploration may be conducted by the keen eye of a surveyor. In the summer of 1883 Mr. Charles E. Lowe, when on the top of Mt. Washington, saw two descending ridges of Randolph Mountain appearing over the col between Mts. Jefferson and Adams. Later, during the same year, I was with Mr. Lowe when he searched for and found a point on one of the aforesaid ridges from which the house and tower on Mt. Washington can be curiously seen, apparently *resting on the col* which connects Mts. Adams and Jefferson. In August of this year Mr. Lowe and Mr. Hunt, assisted by Mr. George A. Sargent, of Boston, felled a number of trees at the outlook, whereby an unobstructed view is obtained of the extreme summit of Mt. Washington. A short path, branching off from the path to the Pond of Safety, now leads to the view-point.

---

ROUND MOUNTAIN. BY E. B. COOK.

Although it may be thought that "Round Mountain" is rather ubiquitous and familiar, yet the secluded position of this Round Mountain,

situated on the line dividing the townships of Jefferson and Berlin, made it a debatable question which is the best approach from Randolph. After some consideration the writer decided that the surest way was by the top of Starr King, which would enable one to see clearly the position of the point of attack. Upon the 19th of September — a magnificently clear day — I rode over to the Waumbek House at Jefferson. The ascent of Starr King occupied but a few minutes over an hour. The path needs clearing out; for, in addition to a number of fallen trees around which the path now deviates, I counted thirty-six prostrate trees which it was necessary to cross. The view from Starr King is widely known, and has been well described in the guide-books. The especial objects of interest to me were Round Mountain, the Pilot Range and what lies between it and the Pliny Range, and the peaks of the Pliny Range. There seem to be six clearly marked summits of the Pliny Range, — one lying northward of Starr King, the humble peak set forth upon recent maps as "Mt. Pliny" being at the extremity of the range toward the south-east. Looking along the Pliny Range to the eastward of Starr King, two higher peaks are to be seen. On following the short path which leads from the summit of Starr King to the spring, I noticed a fresh line of blazes leading off eastward, toward the crest of the ridge. A walk of twenty-nine minutes brought me to a marked tree at the end of the blazes, upon the highest peak of the Pliny Range. The tree was emblazoned with a large letter M. I subsequently learned that the blazed line had been made by Mr. Nathan Matthews, of Boston, as a prelude to a path to be cut out next summer. The result of a barometric observation gave an altitude of 4,095 feet, — about 250 feet higher than Starr King. The summit is sparsely wooded, and a very little work would be required to give a circular view, and one more extensive than that from Starr King. Ten minutes' walk brought me to another eminence but 115 feet lower than the preceding. A hundred or more years ago this aggregation of peaks was known as the Pliny Range. When the Rev. Starr King was deservedly complimented by having one of the peaks of the range named after him, map-makers found it necessary to move along the name "Pliny Range," in order to make room for the name "Starr King." In recent maps the name "Starr King" has usurped the place of "Pliny Range," and to the lowest peak of the range is affixed the name "Mt. Pliny"! How would the genial Starr King relish being involved in such discourtesy! The classic *shades* of the Plinys should haunt the perpetrators of the incivility until they rectify the injustice they have brought about! The highest peak of the range ought to be known as Mt. Pliny, or Pliny Mountain.

I proceeded along the ridge still farther to the eastward, and then, keeping in sight the semi-circular top of Round Mountain, began a descent toward it. The growth passed through but little impeded my progress. After descending diagonally for some distance, a long outlying ridge, running down northward, shut out the view of my goal. Here the

compass was brought into requisition. First a small rill was crossed and then a brook, and, in the depression beyond the ridge, a still larger brook. All of these, I think, are head-waters of what is called "Garland Brook." The depression between the shoulder, running down from the Pliny Range and Round Mountain, where I crossed the brook, was found to be 1,879 feet below the highest peak of the Pliny Range. From the brook it took fifty-five minutes to reach the summit of Round Mountain. Its top is extensive and rather thickly wooded, so that outlooks are very limited, and one has to resort to climbing trees, in various directions, in order to see out on every side.

Round Mountain is too much surrounded by near neighbors to command a wide view. Between it and the Pilot Range is a mountain formed in part of terraces; and it is about the same height as Round Mountain, which I found to be 3,860 feet high. In addition to searching for views, I devoted some time to combining the refreshments of rest and lunch. At nearly 3.30 p. m. a southerly course was taken, with the intention of flanking the lesser Pliny and of striking one of the wood-roads leading into Stag Hollow. In descending Round Mountain a sight was had of the houses on the top of Mt. Washington, and the direction taken was a little east of south. After a while rills were crossed, and the beginning of a logging-road was apparent. It did not seem promising, and so a southerly course was still farther pursued. A little way on an enticing wood-road was followed, although it did not proceed in quite the desired direction. An examination of Walling's map will show that no streams are depicted flowing from Round Mountain or the Pliny Range to the eastward. As the nearest mill is situated in Stag Hollow, it seemed natural to suppose that the branching wood-roads in this region would lead into a tote-road that made its exit by way of Stag Hollow. Although my compass protested that the seductive road was going wide of the intended goal, I followed the road. It grew better and better, and was much improved by excellent beddings of corduroy. The walking was so good that it was easy to go three miles an hour. Another examination of the compass showed that the agreeable road was leading me far from my intended course, so I took a branch-road which went more nearly as I desired. It soon led into most voluminous cuttings,—through upturned trees with roots "possessed of every terminal facility." Again an admirable tote-road was struck, but soon I found it was not leading where I wanted to go. Suddenly the road led out to the "Bog Dam" upon the Upper Ammonoosuc, about four miles northeast of the Pond of Safety! It was not quite three hours since I had left the top of Round Mountain. As it was not my intention to follow the Ammonoosuc to the settlements at Milan, I crossed the little river and started on a wood-road which led up-stream. At a short distance I came upon a logging-camp of many cabins, used by the choppers of Bog Dam. It was now half-past six, and the daylight was fast waning. As it was not far from the time of full moon, it seemed possible yet to make my way

out of the woods. I followed a wood-road leading southwesterly from the camp, but it soon proved to be badly obstructed. Looking at my compass, it was impossible to distinguish the ends of the needle, and the light of a candle only made its silvered and blued extremities glisten equally and undistinguishably. So I concluded that the best thing to do was to fall back upon the camp I had passed, and entrench myself comfortably for the night. At ten minutes of seven P.M. I regained the deserted camping-lodges, and selected the combined dining-hall and kitchen as my domicile. It contained a large stove, and a supply of wood ready cut for use was neatly piled in a corner. A fire was quickly kindled, and commenced dispensing its grateful warmth. I carried in more wood from a pile just outside of the lodge, so that the supply should not give out during the night. As a lounge, the top of a rustic dining-table was placed upon a bench and a three-legged stool, and set within a few inches of the stove. A suitably shaped stick of wood and a board resting upon it formed a pillow. They were *down* during the night. Supper consisted of what had been, fortunately, left over from lunch. An extra supply of chocolate was in my bag; but in order to economize weight, I had substituted a leather cup for the tin one I usually carry; so, although an excellent spring was near by, no hot chocolate could be made. What cooking utensils were left in the lodge were neither suitable nor attractive. To soften my chocolate, it was put upon a bit of wood placed upon the stove. I had at hand the materials for making a rudimentary kind of chocolate cake. On one side of the roof of the lodge the waterproof covering had rolled up and off, so that the moonlight could be seen streaming through the rafter-boards. During the evening the barking of foxes broke upon the stillness of the wilderness. Much signalling and conversing was indulged in. I dreamily wondered if malaria was to be dreaded, as the foxes seemed to be fortifying themselves by a course of *bark*! The night was cold, and the lodge large and well-ventilated; so the stove was kept ruddy by a liberal supply of wood. Four or more hours of refreshing sleep were obtained, interrupted by opportune awakenings for the replenishment of the fire. On going out in the early morning, silvery frostwork was visible all around, and the sweet voice of a white-throated sparrow was heard chanting his matins. At a quarter after five, as the ends of the compass-needle could then be distinguished, I started up the Ammonoosuc Valley toward the Pond of Safety. For about a mile and a half I followed a wood-road, and afterwards one of the branches of the Ammonoosuc. The brook I followed led upward in the proper direction; and before long I recognized above me, on my left, a well-known rocky and wooded crag of Crescent Mountain. Knowing, then, that I was just back of the Ice Gulch, I first directed my course into the depression north of the Gulch, and thence took a diagonal line, so as to strike the path which leads from the Ice Gulch to Randolph Hill. This was readily accomplished, and a few minutes before nine I arrived at the welcome door of the Ravine House.

## NOTES ON THE REGION EAST OF WILD RIVER AND SOUTH OF THE ANDROSCOGGIN. BY A. L. GOODRICH.

BEING personally well acquainted with a part of this region in regard to which information is called for by our Councillor of Exploration, I contribute a few notes, which may be of service to those who care for information on minor details. My knowledge is confined to the region about Chatham, N. H. Several seasons spent there enable me to speak with a certainty that could not be expected of a casual visitor.

Mr. E. B. Cook has visited this region, and written of his ascents of Mts. Royce and Baldface and of Speckled Mountain. He makes a mistake, however, in giving the local name of the highest spur of Baldface as "Baldpate"; it should be "Baldcap." Another mistake as to names in this neighborhood ought to be corrected. Several years ago Mr. W. H. Pickering and party ascended Baldface from the Jackson side. He speaks of crossing successively Sable and Eastman Mountains before reaching Baldface. The State map makes the same mistake. The name of the summit between Sable and Baldface I do not know; but Mt. Eastman is a heavily wooded summit *east of south* from Baldface, and nearly on a line with the much more insignificant and more distant Sloop Mountain of the State map.

The ascent of Mt. Royce is a favorite recreation of mine. It is an odd mountain. It appears to be built of four immense steps. If it were higher or more isolated, so that it could be got in profile, it would show an outline much like that of the Giant Stairs. No better practice in climbing of ledges can be got in the White Mountains short of the Presidential Range. Upon the southern face of the mountain, on Mad Brook, can be found two falls of much more than ordinary beauty, situated in rocky gorges, well worth a visit on their own account. There has been a tradition of these cascades among the natives; but they have never been visited by tourists until this year, when the writer had the pleasure of being the first to reach them. They are some seventy feet high, beautiful at almost any season, magnificent after a heavy rain. They can be easily reached by following the logging-road through Evans' Notch as far as the third bridge, then turning directly north, descending to the bed of Cold River, crossing at the fork, and following the brook that comes in on the left. This brook itself forks shortly; and one of the falls referred to exists in each branch, not very far from the junction.

Speckled Mountain has been well described by Mr. Cook; but it may be well for future climbers to know that he "roughed it" up one of the ridges, probably all the way not more than twenty rods from an excellent path which exists on the southern slope of the very ridge he followed. This path follows the valley of Bickford's Brook, and on this brook there is a series of four cascades. These, like those on Mt. Royce, were first found by tourists this season; and no one who may visit Chatham should miss seeing the second in the series.

I take pleasure in presenting to the Club a set of photographs of these cascades, taken by a young amateur who visited them first in company with the writer. Without being remarkable specimens of the photographer's art, they will serve to show what there is to tempt and to satisfy the pedestrian.

It remains to say a word about Red Rock Mountain. Standing as it does at the head of the long depression which contains the Upper Kezar Pond, it is very noticeable from the south, its color (due to the presence of iron) furnishing an additional attraction to the eye. From the north it is indistinguishable from several other elevations about it. In reality it is an insignificant elevation on one of the many spurs running out from Speckled Mountain. It is not worth a visit.

---

AN EXCURSION OVER MTS. NANCY, ANDERSON, AND LOWELL. BY  
E. B. COOK.

ON the afternoon of the 7th of September, 1885, Mr. Hubbard Hunt and the writer were driven to Jefferson Station, and thence walked over the Cherry Mountain road to the White Mountain House, where we spent the night. The sky at sunset did not give rose-colored promises, so that once during the night, when the stars were veiled in clouds, the prospect for the morrow did not seem at all hopeful. In the early morning some mist-clouds rested upon the "Sugar Loaves" and higher up on the larger mountains, but there appeared to be every prospect of a fine day. At nine o'clock we left Fabyan's for Bemis Station, through the Notch. A little before ten o'clock an observation of my aneroid was taken at Nancy's Bridge, the height of the brook beneath being a basic altitude ascertained by levelling for the railroad. From the bridge our way was across a field and by a wood-road to a point nearly half a mile up Nancy Brook.<sup>1</sup> It was seven minutes before one when Mr. Hunt and I reached the top of Nancy, having lunched at the lake below. Here we studied and enjoyed the view for some time, and then inscribed our names in the record. We found that no entries had been made since the first placing of the record cylinder. In leaving the top of Nancy our course was toward its side which looks upon Mt. Anderson. A valley lay between, far below us; and two small ponds were visible, from which flows one of the minor branches of the East Branch of the Pemigewasset. The mountain-side seemed so precipitous that we thought it advisable to follow the ridge of the mountain for a short distance, and descend where the way was less steep. Our exhilaration of spirits, the *facilis descensus*, and the

<sup>1</sup> In the December number of APPALACHIA for 1883 is an account of an "Ascent of Mt. Nancy," written by Mr. Albert Matthews, who gives a description of the way up the brook, of the fine falls by which it is adorned, of the lake situated in the depression between the mountain-heads, and of the view from the summit.

denseness of the leafage beguiled us into forgetfulness of the compass and of the lapse of time; and in about fifty minutes after we had left the summit of Nancy we had reached a remote tributary of the East Branch, and were going toward Mt. Willey instead of Mt. Anderson; so we retraced our steps, and once again stood upon the summit of Nancy. Exactly two hours had been carelessly squandered. It was now eighteen minutes past four, and we started off with alacrity for the precipitous side of Nancy, from whence Anderson is visible. The descent at first was steep, and passage-ways had to be looked for around and down high, overhanging rocks; but a little way down the travelling became easy, although the slope was abrupt. Mt. Anderson was all the while in view, and for some time the lakes in the valley below. Our course was directed towards the southwestward, so as to pass to the right of the lakes. In the hollow, and at the beginning of the ascent of Mt. Anderson, a number of trees were found prostrated by the wind. Near the top of Anderson an admirable view was obtained of the valley we had passed, and of the massive form of Nancy. Two large recent slides and a smaller one deeply scarred the southwestern side of that mountain. It required an hour and fourteen minutes for us to go from the summit of Nancy to that of Anderson. The top of Mt. Anderson is rather thickly wooded, but restricted outlooks can be had. In the June number of *APPALACHIA* for 1880, Professor Webster Wells has described the view from this summit, and says that "a projecting ledge on the southwest side affords a grand view, comprising all the peaks of the mountain district from the Northern Kearsarge around by the south and west to Mt. Hale." Mt. Anderson is so surrounded by near neighbors, that even if its summit were cleared, its view would be circumscribed. From the top of Mt. Anderson to the top of Mt. Lowell took just fifty-three minutes. On page 166 of the same number of *APPALACHIA*, Professor Wells describes the view from Mt. Lowell. As it was twenty-five minutes after 6 P. M. when we reached the summit of Lowell, there was not sufficient light to see the view to advantage, except that Mt. Carrigain rose most grandly on the southwest. When I was on Mt. Lowell several years before, Mr. George A. Sargent and myself were regaled with a heavy thunder-shower, and then saw but dimly the mountains near at hand. At half-past six my barometric observation was taken on the summit of Mt. Lowell, and a candle had to be used to read the registering of the thermometer. Professor Bond estimated the height of Mt. Nancy at 3,800 feet, and that of Mt. Anderson at 4,000 feet. Professor Guyot's measurement of the altitude of Lowell, using a pocket-level, yielded 3,850 feet. The height I found for Mt. Nancy year before last was 3,924 feet; and this year a discrepancy of fifty-nine feet additional is indicated. Mt. Lowell, by my determination, is a little less in height than as given by Professor Guyot, and Mt. Anderson from thirty-four to forty-five feet higher than Mt. Lowell. Mt. Nancy is a much more widely extended mountain than either Anderson or Lowell, and is probably over a hundred and fifty feet higher than either.



Towards the southwest the descent of Mt. Lowell is steep, and huge masses of rock are built up in terraces; towards the south — lower down the ridge — wind and fire have conspired to produce the most woe-begone of tracts. Our descent from Mt. Lowell, therefore, could not well be accomplished by night, relying upon the light of a candle and upon obtaining a sufficiency of birch-bark for torches. If we had had at our command the two hours that were squandered in unintentionally exploring the ridge of Mt. Nancy, running northward, the Carrigain Path might have been reached, and we could have passed the night at Livermore Mills. As it was, a descent was made to a spot where a soft resting-place and an abundance of fuel could be obtained. A huge fire was first built, and then by the aid of birchen torches, Mr. Hunt endeavored to find water, but did not meet with success. The lack of water was chiefly felt because it was requisite for making our coffee or chocolate. Before long, drops of rain began to seek us; but the gentle sprinkle was caught by the branches overhead. As the evening advanced, the rain-fall became aggressive. During the night it rained smartly, and the wind blew with gusto. Mr. Hunt kept the fire brightly burning throughout the night. He was encased in a waterproof coat; and the writer was wrapped up in a cardigan jacket, a gossamer cape, and a heavy shawl. Our beds of moss became quite wet, but we managed to sleep four or more hours during the night. In the morning it was still raining, and fog-clouds obscured the outlook. It was decided that we would put off breakfast until we reached water, and could have some refreshing hot coffee. At half-past five A. M. we started downward, trying to follow the crest of the descending ridge as nearly as possible. It was raining steadily but gently, and a thick mist covered all around us. After a little while we struck upon the commencement of choppings, and tried several initial branches of wood-roads. Our packs continually reminded us to "beware of entangling alliances." We worked our way with determination, over, under, and through mazes of obstructions. The course we had taken was somewhat further eastward than was intended. We were glad to come upon a tote-road, which was somewhat overgrown with young growth; but our progress became more rapid, and the road struck and followed one of the tributaries of Sawyer's River. The tote-road seemed to get better and better until a logging-camp was reached; but past the camp it grew worse and worse. All the while I was hoping that our road would lead into the Carrigain Path; it improved greatly in character, and finally came into the desired path, about a mile and a quarter from the Livermore Mills. It was very pleasant to see the pointing arrow of one of the sign-boards directing "To Carrigain," and to know that we had now an easy way before us, and an abundance of time. As it was a quarter after eight, and the sparkling brook was at our side, we were quite ready to break our fast. A gentle rain was falling; but a large stump, whose wood was like tinder, soon gave us a good fire, and before many minutes we were enjoying our delicious hot coffee and hot buttered toast, with other tempting supplies. It was

over an hour and a half before we again started onward. In twenty-nine minutes after starting, we were at Livermore Mills; in twenty-one minutes more we reached the road from Bartlett to Bemis; and in thirty-eight minutes more we arrived at Bemis Station. A time-table that I had, set forth that a train would stop at Bemis at forty minutes past eleven. At a little after the time a train drawn by two engines was seen approaching rapidly. It did not seem to be going to stop; so a party of young men whose interest we had excited, seized a red flag and frantically waved it over the track in front of the engine. In the rear car the conductor was to be seen eagerly motioning to the engineer not to stop. The danger-signal, however, brought the train nearly to a stand-still, and Mr. Hunt and I boarded the cars with alacrity, rejoicing that we were to suffer no untoward delay. Our homeward route was through the Notch and by Whitefield to Jefferson. We walked in a driving rain for much of the way from Jefferson Station to Randolph, where we arrived not long before supper-time.

---

#### AN ASCENT OF MT. GARFIELD. BY GAETANO LANZA.

At a quarter past five o'clock on the morning of Aug. 17, 1885, a party of three, consisting of Messrs. Robert W. Candler, G. Herbert Potter of Brooklyn, N. Y., and the writer, started from Goodnow's for a trip over Mts. Garfield and Lafayette. We drove along the Bethlehem road until we reached the logging-road which leads to Gale River Mills; and finding the latter passable for our team, were able to continue as far as the mills themselves, which we reached at 6.35 A. M.

Starting from here on foot, prepared for a two days' tramp, we proceeded a mile and a quarter farther on the logging-road, till we reached the railway bridge over Gale River. Here we lost over an hour in the vain attempt to find some point on the railroad from which the top of Garfield should be visible, and from which we could make the ascent by compass instead of following the brook. We started, finally, at 8.17, to follow the river, intending, on coming to the forks, to take the right-hand branch, and expecting thus to reach Haystack Lake, and thence the summit. We found a large number of logging-roads running in all directions, all of them in poor condition, very wet and more or less obstructed by fallen trees. Reaching the forks, we proceeded by a fisherman's trail along the right-hand branch; and this trail, as long as it lasted, formed the easiest and pleasantest road to travel of any that we found in the ascent. We finally reached another fork at 10.09 A. M., the distance from the bridge being about four and a half miles.

After due deliberation we decided to follow the left-hand branch in this instance, and I think we did right. The left-hand branch led northward, and gave us a much steeper ascent than the other. The right-hand one, taking its rise, I think, near the depression in the ridge leading from Garfield to Lafayette, would have led us very much out of our way.

After leaving this fork, we tried to follow always the largest branch, whenever any more forks were reached; and after passing two very beautiful falls and a number of pretty cascades, our brook finally vanished underground, and we found ourselves approaching the summit by a very direct course. Continuing our journey, we reached the top at 5 P. M., the distance from the forks being from two and a half to three miles.

As to the character of the road, I have already described the first portion, which was not very easy and not very pleasant; then came the fisherman's trail, which furnished as good travelling as could be desired; and then, after passing the forks, we were troubled by the presence of a great deal of young growth, together with much fallen timber, through which it is impossible to proceed rapidly. Near the top is also a wide belt of pine scrub. Nevertheless, taken as a whole, the character of the travelling is not so bad as in several other places in the mountains.

After remaining three quarters of an hour on the summit, enjoying the view, building a fire, etc., we started at 5.45 for the lake, which we reached by aiming directly for the ridge between Garfield and Lafayette, as this lake is not visible from the summit, but lies almost on the ridge between the two and a little over on the northern slope. Here we camped for the night, and resumed our journey the next morning at 5.15 A. M., following the ridge towards Lafayette, except once or twice, when, by trying to shorten the distance, we lengthened it.

From the time we left the lake we were always in the woods, with no outlook, until we emerged suddenly upon the rocks just behind Eagle Cliff, whence we proceeded over the Cliff to the summit of Lafayette, and thence down by the bridle-path, and back to Goodnow's.

We had no time to take profiles; but the view of the wilderness back of Garfield, and the beauty of the immense mass of mountains to the south as they can be seen only from this point, fully repaid us for our labor.

The summit itself is formed of a very few large rocks, presenting a perfectly flat surface on top, the mountain being entirely wooded with this exception, the part that is free from trees being not more than seventy feet square. The writer believes that if a compass bearing could be obtained from some point on the railroad between the bridge and the Profile House, not very far from the bridge, the climb would be very much shortened; or, failing in this, that a compass line followed from the bridge to the summit would give a shorter climb, with no worse travelling than by following the brook, as we did. I will add that the brook is full of trout and much frequented by fishermen, who, however, seldom have reached the summit.

The writer has been informed of an ascent made in 1881 by a party consisting of Rev. Mr. Spaulding of Boston, Professor Cook of Hoboken, Messrs. Seymour and Wadley of Brooklyn, N. Y., and Mr. Henry Currier of Boston. This party ascended Lafayette, and proceeded over the ridge to Haystack Lake, where they camped for the night, ascending Garfield the next day, and then descending by the bed of one of the

brooks, passing some deep falls, — whether the same that we passed or not, I do not know, — and coming out by Gale River Mills.

Another fact worth noting is that the lake is much nearer the ridge than is represented on the State map.

---

## Reports of the Councillors for the Autumn of 1885.

### Improvements.

BY I. Y. CHUBBUCK.

IN the spring report of your Councillor the clearing out and recutting of the path from Waterville to Livermore was strongly recommended. Repeated efforts have been made to that effect, but nothing has been accomplished. Persistent inquiry has, however, revealed the fact that the path is not in such condition as we were led to believe, but is still a good path. Some cutting out and repairing are needed, as well as a number of guide-boards at the intersection of various new logging-roads.

Mr. Louis F. Cutter, who went through from Elliott's to Livermore late this season, and who probably was the last person over the path, has sent me a letter from which I make the following extract: —

“ A rumor has got abroad that the Waterville-Livermore path is in a very bad and almost impassable state. This rumor, I suppose, deters many people, especially ladies, from attempting the walk, which is really not very difficult. From Elliott's to Beckytown the path is good,<sup>1</sup> and probably will always be kept so, as it is used a great deal by the boarders at Waterville. The brook-crossing at Beckytown was rendered a little inconvenient by the slide of Aug. 13, 1885. The path on the other side is not very easy to find. For about half a mile beyond Beckytown the path is a little obscure, —in fact, it is the hardest part of the whole path to follow; but probably it will not be so in the future, because it is one way of getting at the great slide which came down the north side of Tripyramid last summer. From the foot of the slide to the top of the ridge which seems to be the divide between the Mad River valley and the Swift,

<sup>1</sup> This portion of the way is over what was an excellent path long before the new Livermore path was cut by the Club. — ED.

the path is good ; also from the divide to the ravine, which the path follows down into the Swift River valley, though between the divide and the ravine there are a few small windfalls. Between the foot of the ravine and the Swift River crossing there are two quite large patches of fallen timber, around which the path should be cut. The log crossings over the two branches of Swift River are in good condition. From Swift River about a half or three quarters of a mile up a hill, the path is good ; then it comes suddenly into logging regions of Livermore, where it is wholly obliterated by branches, tree-tops, and bent and broken trees. However, from this point the logging-roads lead down to the end of the logging-railroad, which may be followed to Livermore Mills. The logging-roads are mostly good for walking, but in some places they are blocked up with brush, and at others they are wet. It is easy to find the way from Waterville to Livermore, because all the logging-roads lead to the mill ; but going from Livermore to Waterville a person who did not know the way would have some difficulty in finding the end of the path, there are so many logging-roads branching in all directions. Several signs are necessary to make the way clear, — about ten, I should say.

“ I think it would cost a good deal to put the path into first-class condition, but a very moderate expenditure would make it easily passable for ladies, and make it easy to find the way in either direction.

“ The most needed improvements are the cutting of the path around the large windfall patches between Swift River and the ravine, and the placing of signs at the Livermore ‘ street corners.’ ”

We hope that another season will see this work done, as it is very evident that a small sum of money will put the path in as good condition as need be.

We hoped to be able to report the repairing of various paths, but have heard from Mr. E. B. Cook only. He sends word as follows :—

“ It may be of interest to you to learn something as to path-making at and around Randolph, and so I shall give you an account of what has been done :—

“ 1. The lower part of the path up Mt. Adams, via Durand Ridge, was considerably shortened by keeping entirely upon the ridge, instead of following Snyder Brook for a distance. The whole length of the ‘ Durand Ridge Air-Line Path ’ up Mt. Adams is now four miles and three hundred and sixty-six feet. The path has been most carefully cleared by Mr. L. M. Watson, so that not a log has to be stepped over.

“ 2. In the last week of September, Mr. W. H. Peek and the writer made a blazed trail leading from the Durand Ridge Path to King’s Ravine, tapping Lowe’s Path about a quarter of a mile below the floor of the ravine. Mr. Watson intends to cut out this trail as a path.

"8. Mr. Peek and Mr. George A. Sargent have blazed a trail from the waterfall at the Gulch to Randolph Hill, which much shortens the way from the Ice Gulch; and it is intended to have the route opened as a path.

"4. Mr. Nathan Matthews, of Boston, last summer marked a blazed line from the top of Starr King Mountain to the summit of Pliny Mountain, with the purpose of having a path made next summer.

"5. Mr. Sargent and the writer camped out a night in the Carter Notch, with the intention of spotting a line up Wildecat Mountain, and to the outlook upon one of its lower spurs; but our purpose was not carried out, on account of the combined discouragement of rain and of the badly obstructed condition of the upper part of the path leading from the Glen House to the Carter Notch."

The new work planned in the spring has been fully carried out. A path eight miles long has been cut and blazed over the Carter Range to Mt. Moriah. A log camp has been built in a favorable situation to shelter parties wishing to spend some time on the range. The expense incurred on this enterprise has amounted to \$102, one half of which was received from contribution of members and friends, and one half from the Club treasury. Mr. W. G. Nowell had charge of the construction, and his report is appended.

---

#### THE CARTER-MORIAH PATH. BY WILLIAM G. NOWELL.

IN 1883 a branch of the Carter-Notch path was extended by Mr. E. B. Cook and Mr. Charles E. Lowe, about 1,400 metres, to the northern or second summit of Carter Dome; and the same year we built on the Dome proper a stout tripod observatory, which still stands firm. The path from Gorham to the top of Gorham-Moriah had been opened by Professor Quimby, for the convenience of the geodetic observers stationed on that summit.

The energetic expedition so graphically described by Miss Edith W. Cook in *APPALACHIA*, Vol. III. No. 4, p. 299, and the enjoyable days and nights which the Club camping-party spent on the northern part of the range in September of 1884, stimulated anew our desire to see the long-projected Carter-Moriah path put through. The favor of the Department of Improvements in placing the enterprise under our direction, and the contributions of friends and mountain-lovers, as given below,<sup>1</sup>

<sup>1</sup> Contributions in behalf of the Carter-Moriah Path and Camp: C. R. Milliken (Glen House), \$10; M. C. Wentworth (Arden Cottage, &c.), \$10; Stratton & Edwards (Alpine House), \$5; John F. Twombly, \$1; Frances C. Twombly, \$1; Hermann Uhl, \$1; Oswald Uhl, \$1; Grace Nowell, \$1; through Mr. E. B. Cook, \$10; through R. B. Lawrence, Esq., \$10.

removed the last remaining obstacles not otherwise easily overcome. So a construction party was organized, consisting of Messrs. H. and O. Uhl, J. F. Twombly, and A. C. Gwynne, Misses F. C. Twombly and Grace Nowell, — all of New York; and Messrs. H. H. and A. Hunt, T. Reed, and T. S. Lowe, — all of Randolph, N. H.; with the writer as engineer-in-chief, axe-man, packman, commissary, cook, and whatever else might be needed.

After long waiting for the summer rains to cease, we were to go in from Gorham on Friday, August 14; but a twelve-hour southwest storm delayed us until Saturday, when again the loss of a visiting stranger in the mazy woods around Safety Pond, which so treacherously belies its name, called our men away to the fortunately successful search. We retained Arland Hunt, however; and having secured Charles Foster, of Gorham, as additional packman, we climbed Gorham-Moriah and established ourselves on the site of the Club camp of 1884 by nightfall. On the way up, while we were feasting on the blueberries of Mt. Surprise, one of our swift runners caught a young rabbit alive, which we christened after his mountain, enrolled in our party, and entered as guest at the Mt. Adams House on our return. Nor must we omit mention of Osman Pasha, our eight-months-old St. Bernard-Newfoundland, who carried his great shaggy black coat and handsome face through all our mountain tramps that summer.

To save time for our other work we had brought in three tent-coverings; and having set up the old Club frame in the little ravine just under the summit of Mt. Moriah, in such a position as to keep us free from annoyance by smoke from our camp-fire, we roofed and sided it with two of these pieces of parafined cloth. Here we rested on Sunday, getting inured to woods-life, and enjoying a fine sunrise and sunset; and just after dark, with birch-bark torches and magnesium tape, signalling to the village below us, and to Mts. Washington and Kearsarge (North).

Sunday afternoon Mr. Hubbard Hunt joined us with fresh supplies, and on Monday morning we cut and blazed, packs on back, the first section of our path, about 1,400 metres down the steep southwest slope of Gorham-Moriah to the first col, from which a brook finds its way southeasterly into the Wild River valley. Here we lunched, and then worked on in a little more southerly course over a comparatively level ridge, which, after two minor breaks, terminates at the rocky moss-covered bed of a stream flowing into the Peabody. Following up the right bank of this stream a short distance, we hastily made camp in the early dusk, about 1,800 metres from our noon station. Before we had finished, Frank Reed and Thaddeus Lowe came in with the Hunts, who had returned to meet them as they came over Moriah that day with heavy packs, leaving us New-Yorkers to prepare beds, shelter, and fuel for the night. A hot supper by the camp-fire in that picturesque brook-bed, a smart thunder-storm during the night, a refreshing sleep on fragrant boughs, and we were ready for a second stretch.

Tuesday we found the site of the camp of 1883 a little farther up the same brook-bed, on the southeastern slope of Imp Mountain. It seemed a pity to destroy the old camp, which was yet in fair condition; but we had larger plans. So, after despatching Reed and Lowe to clear out, away back to Mt. Moriah, the path we had cut and blazed, the rest of us set about tearing down the old and building the new camp. This we made about sixteen feet wide and thirteen feet deep, over six feet high at the front and about three feet at the rear. It will amply accommodate a party of twelve, and fifteen would not crowd it. The sides and rear we built up with logs, so carefully selected and hewn as to require but little chinking with moss. The roof we covered with fir-bark, there not being enough birch for the purpose within available distance. The new camp stands nearly on the site of the old one, and faces the same huge boulder-like tree-clasped projection of the rocky cliff, between which and the right-hand side of the camp grows a small but picturesque grove of trees, which we trust future visitors will spare, and get the little firewood they will need from beyond the brook, below and to the left of the camp. Of one comfort we can assure our successors: this camp will not smoke. We spent two days in the shelter of this secluded dell, amid varying winds; and all the smoke of our camp-fire went up the natural flue formed by the camp, its flanking grove of trees, and the angle of rock in which it stands. The exceptionally great depth of the camp will secure better shelter also than usual from storm and rain. The elevation of the camp above mean sea we made about 3,500 feet, or nearly 200 feet higher than the camp on Mt. Adams.

On Wednesday, Reed and Lowe remained to cover camp (we had used our tents the night before), and with them one of our young people with a slight axe-wound in his foot, while the rest of us cut and blazed the path on over the southeast spur of Imp Mountain, and the southwest branch of that spur which makes towards Mt. Carter. Our aim was direct for the northernmost peak of Carter; and before dark we had climbed its precipitous northern face, struck the stretch of path cut by Messrs. Cook, Peek, and Hunt in 1884, and nearly reached the col between Carter North and Carter Middle, with our construction work. The Great Range, now purpling with the setting sun, admonished us that camp was fully two miles and a half away; so, abandoning the glories of the heights, we beat a swift retreat to our commodious dwelling in the welcome glen, which had already come to seem our own, but which we must leave on the morrow.

Thursday we all pushed on together, pack-bearing, cutting, blazing, and clearing, as we went. On Carter Middle we came in sight of Carter South and of the long knolly ridge which first bends out toward the west as it slopes downward, and then at the col climbs again to the far-off southern peak of the great mountain wall which we call Mt. Carter. It was a long bit of path to cut and mark from where we quit work the day before to the rivulet in the North Notch (north of the north summit of



Carter Dome). But despite the encumbrances on our backs, and despite our loss of two hands sent on ahead at noon to bring in needed supplies from the Glen House, we accomplished the task. Sundown saw us pitching tent and gathering boughs about 1,200 metres from the beautiful north summit of Carter Dome.

Friday the Hunts went back over Carter South to clear out the path we had marked, while we New-Yorkers prepared to build a permanent camp, — an operation interrupted, however, by a heavy southwest twelve-hour rain. It rained and thundered until past midnight. With the exception of this Friday's rain, the weather during our expedition was all we could desire, — good working weather at the altitudes we kept, 3,300 to 4,900 feet.

Our foragers found the Carter-Notch path so completely blocked with fallen timber that they had to camp out the night before, half-way down to the Glen House; and their bountiful supplies from the generous Glen came in, none the less welcome, some hours after our baskets were empty, Friday noon. Strengthened by rest and food for the last morning's work, we struck camp on Saturday, pushed straight up to "Carter Cone," entered our second record, lingered a half-hour in the midst of the clearing landscape, — a marvel of beauty, — and then began our tramp out. An hour's tarry on noble Carter Dome, — broad, massive, leonine; another hour, and luncheon with a little vain angling for trout at the dark ponds of the wild Notch; and then over three hours' walk to the Glen, more than half of which time was spent in crawling, climbing, jumping for more than a mile over and under and along the fallen tree-trunks of the worst tangle of wind-thrown forest it has ever been our fortune to encounter. But at last we were out, had greeted our host, Milliken, boarded our wagon, as per agreement, and galloped up to the door of the Mt. Adams House, to land in the midst of a party, from neighboring hotels, in full evening dress.

We had done, in our eight days' outing, as much as we could. The young people with us, thirteen to eighteen years of age, had assisted materially in preparing our camps, and besides other clearing and chopping, had cut along the path over eight thousand blazes! We had expected other volunteer assistance; but short-handed though we were, we accomplished all that we had planned, save a short branch-path, one quarter of a mile from Imp Camp to the summit of Imp Mountain, and the overhanging ledges on its western shoulder, and save that the path is not completely cleared out.

The length of the path cut is estimated at about 13,500 metres (nearly 8.4 miles). Our observations for elevation give a slight increase in each case over the heights recorded in the paper by Miss Cook, already mentioned.

We intend to spend a week or two on the range in the summer of 1886, complete the path, build another camp in the North Notch, measure the entire length of this highland route, place kilometre and some intermedi-

ate signs, especially where a turn is taken or the woods entered from a clear space. We shall also endeavor to find good water on some slope of Carter Middle, and mark a way of egress over Dolly Copp's Imp from Carter North to the Peabody valley. Two years hence, fifteen hundred dry cedar shingles should be carried in during the winter on the logging-road from the Peabody valley, which runs nearest to Imp Mountain, and the next summer the camp be covered with them, the front of the roof being first lifted by fastening along under its edge a six-inch or an eight-inch log.

We hardly need add a word in recognition of the attractiveness of this new region, which the Club's enterprise has now made accessible to mountain-lovers possessed of only moderate endurance. The wild seclusion of its forests, the bold picturesqueness of its rocks and cliffs, the abruptness of many of its slopes, the grandeur and beauty of the mountains that flank the route on either side, — up the valley of the Androscoggin, distances long, open, pleasant, smiling with sparkling stream and sunny fields and human habitations; eastward, almost unbroken wilderness, which huge hills lift on their rugged bosoms, here and there almost to your own level, and rear bare white heads of rock over the deep green basins in which they hide their feet; westward, the continuing glory of the matchless strength and symmetry of the Great Range, that comes into view as we cross Moriah's bald summit, and grants us its noble companionship as we tread in mid-air over the long crest of Mt. Carter; and at last the gathering of all charms to encircle the monarch Dome and his queenly consort, to which the rest must all pay obeisance.

## Proceedings of the Club.

July 21, 1885. — Nineteenth Field Meeting.

Held at the Flume House, White Mountains, N. H.

Vice-President Edmands in the chair.

ABOUT fifty members and friends were present. Mr. George C. Mann was chosen Recording Secretary *pro tem*.

The Corresponding Secretary read a letter from Turin, acknowledging the receipt of the contributions for the sufferers by avalanches in Piedmont.

Professor J. W. Chickering read a paper on "Bowlder Brook Falls, near Mad River, Waterville."

Dr. J. M. Buckley gave an account of a walk from Waterville to Thornton Gore.

Mr. George C. Mann made some remarks about the new Cherry Mountain Slide. The subject of slides in general was then discussed by Messrs. Edmands, Fay, and Buckley.

Mr. Edmands read a paper entitled "A Day on Flume Mountain and a Night in the Wilderness." (See p. 194.)

Rev. M. V. B. Knox, of Littleton, requested assistance from members of the Club towards the preparation of a list of flora and fauna of Littleton for the town history.

Professor Chickering spoke of the observation blanks of the weather bureau.

Professor Fay announced the excursions which had been arranged by the committee.

Sept. 1, 1885. — Twentieth Field Meeting.

Held on Mt. Mansfield, Vt.

There was no meeting for the presentation of papers.

Oct. 14, 1885. — Sixty-eighth Corporate Meeting.

President Higginson in the chair.

About sixty persons were present.

The President congratulated the Club upon the renewal of its meetings after the summer vacation. He announced progress in the work upon the map of the White Mountain region and in the collection of subscriptions for the rental of a room.

The candidates for membership presented at the last regular meeting, fifteen in number, were elected. Thirty-nine nominations were presented.

Professor Gaetano Lanza read a paper entitled "An Ascent of Mt. Garfield." The trip was made Aug. 17 and 18, 1885. The party followed the Dale River from the mills to the forks, and then took the right branch to the summit, passing two beautiful falls and several pretty cascades. The summit is formed of a few large boulders surrounded by a wide belt of scrub. The most interesting feature of the view was the wilderness to the south. The night was spent at the lake situated on the northern slope of the ridge which connects Garfield with Lafayette. The next morning the party ascended Lafayette. (See p. 265.)

A paper by Rev. M. V. B. Knox, entitled "Notes on the Slide at Jefferson," was read by Mr. George C. Mann. The writer described the slide, and mentioned some of the causes which have been suggested. (See p. 254.) Professor C. H. Hitchcock made some remarks upon the subject, saying that although the wet condition of the earth was the chief cause of the slide, the determining point, in his opinion, was the giving way of a large fragment of ledge. He thought that this mass of rock was not over fifteen feet cube, and that the slide consumed four minutes at least. He

also mentioned the slides which took place on Tripyramid, August 13, and which he considered, on some accounts, more interesting than that at Jefferson. The slide of 1869, on the south side, slid over with additions, so that it is now nearly three times its former width, and on the north side a slide started with four heads, which met and slid together for a mile, the total length being one and a half miles. The interesting rocks on the south slide are also developed on the north slide.

Professor C. E. Fay made some remarks on the subject, "Was Chocorua the original Pigwacket?" He gave an account of the settlement of the country north of Nashua, and tabulated the mountain names which appear on the early maps of the White Mountain region. He produced evidence to show that the name Chocorua belonged somewhere in the latter half of the eighteenth century, and then gave reasons for believing that the stream at the mouth of which Captain Lovell had his fight, and which he followed from Pigwacket Hill, was the present Pequawket Branch which enters the Swift River near the Saco.

Mr. F. O. Carpenter announced that a party of members of the Club were intending to visit Monadnock, October 17. He invited members present to join the excursion.

Nov. 11, 1885. — Sixty-ninth Corporate Meeting.

Vice-President Edmands in the chair.

Seventy-five persons were present. The candidates for membership presented at the last meeting, thirty-nine in number, were elected. Eight nominations were presented.

The Corresponding Secretary reported that he had received, besides the usual contributions, a photograph of Mt. Kearsarge (North), contributed by Miss E. J. Baker. He also made a statement concerning the room on Park Street which had been engaged by the Committee.

Mr. George C. Mann presented his report as Councillor of Natural History, referring to the "History of Littleton," which is now in course of preparation, and to the numerous land-slides which have occurred during the past season.

Professor Alfred E. Burton presented his report as Councillor of Topography, stating that a large amount of work had been done upon the map of the White Mountain region.

The report of Mr. E. B. Cook, Councillor of Exploration, was read by Mr. Mann. The work done by the department included the exploration of the Pilot Range and the slides on Tripyramid, and trips over Mts. Nancy, Anderson, and Lowell, and to Round Mountain, east of the Pliny Range.

Professor William M. Davis presented an interesting and instructive paper on Mountain Meteorology. He explained the changes in the color of the sky, which appear to the observer as he ascends a mountain, the changes in the temperature of the air, and in the amount of rainfall. He

also explained the phenomenon of the Foehn wind in Switzerland. He expressed the hope that the Club would assist in establishing meteorological stations in the White Mountains. (See p. 225.)

After an interesting discussion, the following vote was passed, on motion of Mr. Davis: That the Council be instructed to consider the advisability of undertaking to establish stations in the White Mountains for the purpose of obtaining records of temperature and rainfall.

A paper by Mr. E. B. Cook on "Round Mountain" was read by Mr. F. O. Carpenter. The writer proceeded by the way of Starr King, and returned by the valley of the Upper Ammonoosuc and the Ice Gulch Path to Randolph. Round Mountain was found to be thickly wooded. (See p. 257.)

The other paper announced for the meeting was postponed.

December 11, 1885. — Seventieth Corporate Meeting.

President Higginson in the chair.

One hundred persons were present. The candidates for membership presented at the last meeting, eight in number, were elected. Seven nominations were presented.

The President announced that the Club-room was being furnished, and would soon be open to members.

On motion of the Treasurer, it was voted that an Auditing Committee of three be appointed by the President; and on motion of the Recording Secretary, it was voted that the President appoint a committee of three to nominate officers for the coming year. The committees were subsequently appointed as follows: Auditing Committee, Mr. Charles W. Kennard, Mrs. Clara B. Martin, and Mr. E. B. Hagar; Nominating Committee, Mr. Rest F. Curtis, Mrs. M. E. MacKaye, and Dr. W. B. Parker.

The President being obliged to leave, Vice-President Edmands now assumed the chair.

Photographs presented by Messrs. F. C. Briggs and A. L. Goodrich were exhibited.

The report of the Councillor of Exploration, Mr. I. Y. Chubbuck, was read.

A communication entitled "Geodetic Observations from Moosilauke and Mansfield" was presented by Professor E. C. Pickering. After alluding to the advantages of houses on mountain summits, he described the method of determining height by levelling, and explained his own work last summer with the micrometer level. He considered Moosilauke and Mansfield more valuable for permanent stations than Washington, on account of the excessive amount of cloudy weather upon the latter summit.

A paper entitled "The Tripyramid Slides of 1885," by Rev. A. A. Butler, was read by Mr. R. F. Curtis. The writer described the terrible

storm which caused the slides, and gave his opinion that slides were caused by underground streams and the large amount of water held by the soil after a long and heavy rain. He thought the starting-point of slides was neither at the top nor at the bottom, but between. He gave a minute description, with measurements, of the various slides on the north and south sides of Tripyramid. (See p. 177.)

Other papers were omitted on account of the lateness of the hour.

January 13, 1886. — Seventy-first (Annual) Corporate Meeting.

President Higginson in the chair.

In opening the meeting the President made a few remarks, as it was his last opportunity before retiring from office. He spoke of the pleasant features connected with the new Club-room just occupied, on Park Street, and also made reference to the members who had died during the year past, especially Professor Charles E. Hamlin and Hon. Elizur Wright.

About fifty-five members were present. Owing to the absence of the Recording Secretary, the reading of the minutes was dispensed with, and Mr. R. F. Curtis was chosen Secretary *pro tem*. The candidates for membership presented at the last meeting, seven in number, were elected, and nine nominations were presented.

Professor C. E. Fay then presented his annual report as Corresponding Secretary. It was accepted; and on motion of Mr. Curtis, it was voted that the adoption of the rules in the Corresponding Secretary's report relating to the circulation of books in the Library be referred to the Council.

Mr. G. M. Jones presented his annual report as Treasurer, and it was accepted.

Mr. Curtis, as chairman of the committee on the nomination of officers for the ensuing year, reported in print as follows: President, J. Rayner Edmands; Vice-President, George C. Mann; Recording Secretary, Rosewell B. Lawrence; Corresponding Secretary, Charles E. Fay; Treasurer, Gardner M. Jones; Councillors: Natural History, William M. Davis; Topography, Alfred E. Burton; Art, Charles W. Sanderson; Exploration, Wilbur B. Parker; Improvements, Isaac Y. Chubbuck. The Club then balloted, and the candidates presented were all elected.

President Higginson then retired; and Mr. Edmands, the President-elect, took the chair with a few remarks.

A paper on "The Ascent of Popocatepetl," by Dr. A. S. Packard, was read by Mr. Samuel Thurber, and remarks on it were made by the President. On motion of Mr. F. W. Freeborn, the reading of further papers was dispensed with on account of the lateness of the hour.

Colonel Higginson called attention to the fact that the Club-room would be open on that and each succeeding Wednesday evening.

February 10, 1886. — Seventy-second Corporate Meeting.

President Edmands in the chair.

About ninety persons were present. The candidates for membership presented at the last meeting, nine in number, were elected, and eight nominations were presented.

The Corresponding Secretary reported the accession of the American Geographical Society of New York to our list of exchanges.

A paper by Mr. W. G. Nowell on "The Carter-Moriah Path" was read by Mr. C. H. Ames. The work of cutting the path and building the camps was described, and the advantages to be derived therefrom by mountain-lovers were explained. (See p. 269.)

A paper entitled "An Ascent of the Matterhorn," by Mr. Melancthon M. Hurd, was read by Mr. C. W. Sanderson. Mr. Hurd gave a vivid description of his ascent of this glorious peak last summer with two of his sons. Not only the grand views, but the climb of the rocky peak, and over the glaciers and snow-slopes, was minutely described. Professor W. H. Niles spoke of the butterflies, moths, and smaller birds which, borne up from the valleys by currents of air, are killed by the cold on the snow-slopes. He also spoke of the geology of the Matterhorn, explaining the shape of the mountain and the slope of the strata; the rock crops out into ledges on the east face, thus affording a foothold to the climber. Professor C. E. Fay alluded to the ascent of this mountain by Dr. Campbell, and Miss Julia C. Clarke spoke of Dr. Campbell's great enjoyment in mountaineering notwithstanding his blindness. Professor Niles thought that the peculiar character of sounds upon mountain summits might be a source of great enjoyment to a blind person.

The President spoke of the monument which the French Alpine Club proposes to erect in honor of De Saussure, and the request made of the Appalachian Mountain Club in behalf of the project. After remarks, the subject was referred to the Council for such action as shall be deemed expedient.

A paper by Mr. W. H. Peek entitled "An Exploration of the Pilot Range" was read by Mr. R. F. Curtis. The nature of the range was described, together with the views from various points. (See p. 219.)

February 17, 1886. — Seventy-third Corporate Meeting.

President Edmands in the chair.

Nearly a hundred persons were present.

Col. Jed. Hotchkiss, of Staunton, Va., gave an account of the topography and geology of the vicinity of the point in that State recently named Mt. Rogers in honor of the late President W. B. Rogers, of the Massachusetts Institute of Technology, whose early work as Professor in the University of Virginia and as the Geologist of the State lay in that

region. He described the form of the mountain, the route to the summit, and the character of the view, together with other interesting facts. He stated that the height of the mountain, as determined by the United States Coast and Geodetic Survey, was 4,457'; and by triangulation by Engineer H. D. Whitcomb from the track of the Chesapeake and Ohio Railroad, 4,448'. He also gave the following table of heights of points on the Chesapeake and Ohio Railroad visible from this summit, as determined by railway levels:—

Staunton . . . . .	1,387'
Waynesboro' . . . . .	1,284
Swoope Station . . . . .	1,653
North Mountain Station at foot of Mt. Rogers . . . . .	2,060
Variety Springs „ . . . . .	1,905
Ferrol „ . . . . .	1,812
Craigsville „ . . . . .	1,516
Goshen „ . . . . .	1,410

Also the following elevations in the Blue Ridge, serving as triangulation points in the United States Coast and Geodetic Survey, and determined by that Survey:—

Peaks of Otter { Flat Top . . . . .	4,014'
{ Round Top . . . . .	3,888
Bald Friar . . . . .	4,129
Apple Orchard . . . . .	4,260
Fork . . . . .	3,854
Humpback . . . . .	3,646
Jarman . . . . .	3,163
Turk . . . . .	3,469
Cold . . . . .	4,100

Detached range in the Shenandoah Valley:—

Peaked Mountain . . . . .	2,932'
---------------------------	--------

In Appalachian ranges west of the Valley:—

Slate Springs Knob . . . . .	4,200'
Paddy Knob . . . . .	3,880
Bald Knob of Warm Springs Range . . . . .	3,800
Briery Knob . . . . .	4,063

All of these were determined by the United States Coast and Geodetic Survey.



### Excursions of the Season of 1885.

A WALK to RATTLESNAKE HILL took place Saturday, April 18, in which ninety-nine joined. The train left the Old Colony station at 12.30 P. M. The day was fine; a moderate east-wind tempered by the sun made the walk from the station to the hill very enjoyable. Nearly two hours were spent on the hill by the party, some taking luncheon, others rambling upon other hills and rocky knolls in the vicinity. The return was made by a rough path cut through the scrub to the Bunker Hill and Railway Quarries, the investigation of the latter being very interesting to the members. Through the courtesy of the superintendent of the Old Colony Railroad, the express train due in Boston at 5.30 was stopped at Atlantic Station and the excursion cars attached.

On May 9, two hundred members and friends availed themselves of the opportunity to visit Plymouth, Mass. The morning was lowering, but before noon it cleared up. Arriving in Plymouth, carriages were taken by about three quarters of the party for MANOMET HILL, the others viewing the town first and then proceeding to the hill. At the hill lunch was eaten, May-flowers picked, and a view of the surrounding country taken. Manomet Hill is 391 feet in height, being the highest hill in Plymouth County. Returning, the party reached Boston early in the evening, well pleased with the trip.

The May-walk took place Saturday, May 16. The party, numbering one hundred and seventeen, left the Boston and Maine Station at 11.30 A. M. Leaving the train at Gaines's Mills Station, a half-hour was spent viewing Ship Rock, a huge boulder which lies stranded on the hillside. This boulder, with a portion of land, belongs to the Essex Institute. A majority of the party then proceeded by a wood-road to BARTHOLOMEW'S POND in Peabody, while two carriage-loads proceeded to the same spot by the regular road. The day was clear and cool, a strong wind blowing from the east. Bartholomew's Pond is situated among rocky hills, and here the party rambled an hour or more. The walk was continued by wood-road to Lynnfield Station. A short time was spent near Suntaug Lake, and then cars taken for home.

On the afternoon of June 6, one hundred and five members and friends went from the Fitchburg Station to the town of LINCOLN. From Lincoln Station the party walked by road, wood-road, and field to Forest Lake. A half-hour was spent in a grove bordering the lake; from here the walk was continued, by invitation, through the beautiful grounds of a resident, and then on to the high land in the centre of the town. An hour was very pleasantly spent on the reservoir embankment, viewing the surrounding country. The train was taken for the return at about 7 P. M.

A very pleasant excursion was planned for June 17 and 18 to Mrs. CARDIGAN and KEARSARGE, but few were able to participate in it. A

party of eighteen started, on the morning of the 17th, for Canaan, N. H., by the Boston and Lowell and Northern Railroad. Carriages were taken at Canaan for Mt. Cardigan. A delightful hour's ride through the country brought the party high up on the mountain-side, to the last farm-house. A walk of another hour, first through the woods and then out on the bare rocky slope, took them to the summit. The view was fine, the atmosphere being clear and the day perfect. Returning to the station, the party refreshed themselves with crackers and milk, and then left for Potter Place Station in a special car. At Potter Place carriages from the Winslow House were in waiting to take the party to the hotel, which is situated on a terrace high up on the side of Mt. Kearsarge. A very late dinner awaited the returning party, and the evening was spent in social enjoyment. The morning of the 18th was bright and clear. Most of the party ascended to the summit of the mountain in the forenoon, and returned to Boston after dinner.

On the evening of June 30, ninety-eight members and friends left Boston on the steamer "Penobscot" for Mt. DESERT. Two more went by rail, making a total of one hundred. On Wednesday morning, July 1, the party arrived at Rockland, and were transferred to steamer "Mt. Desert" for Bar Harbor. Very little view of the beauties of this route was obtained, owing to the fog. But on nearing Mt. Desert the fog lifted, and the sail around the headlands and approach to Bar Harbor was very enjoyable. The party was very pleasantly quartered at the West End Hotel, the management doing their best to serve the party. Thursday, July 2, was spent viewing the "Ovens" on the north shore, and in the afternoon in the ascent of Green Mountain. A majority of the party went by way of Long Lake and the Green Mountain Railroad, a smaller number walking up the old carriage-road. On Friday a long ride was taken by a portion of the party, another portion going to Otter Cliffs in the forenoon and up Somes's Sound by steamer in the afternoon. Still another party made the ascent of Newport Mountain. Saturday was spent in making other ascents of Green and Newport Mountains. The whole trip was very enjoyable, good weather and excellent management giving the party all that could be wished.

Taking occasion of the field-meeting at the Flume House, a party of fifty or more made the ascent of Mt. LAFAYETTE, July 23, some going up by way of the old bridle-path and a larger number up the new path which starts in near the Profile House. On reaching the summit of Lafayette, those who had arranged to camp for the night walked along the connecting ridge to Mt. Liberty, and camped on the slope where water could be obtained. Other ascents were also made, in the same connection, of Cannon Mountain, Owl's Head, Mt. Kinsman, etc.

During the visit to the Mt. MANSFIELD HOUSE for the field-meeting in Stowe, Vt., September 1 and 2, which forty members and their friends from Boston alone attended, many excursions in the vicinity were made. The summit was climbed on the 1st. A house of fair accommodations

is situated upon the ridge of the mountain, at the base of a rocky knob called the Nose, the long sky-line of the mountain looking somewhat like the profile of the human face. Those of the party who walked were wet by a heavy shower before reaching the summit; but fires in the house and a good dinner put all in the best of spirits. The rain, continuing into the afternoon, kept all indoors until about sundown, when the clouds broke away and gave fine views and a glorious sunset. Wednesday morning found the party enveloped in a thick fog, which did not break away before noon, when ascents of the Nose and Chin were made to take in the views. A small party left the Summit House for the base by way of the long ridge and down the precipitous side of the mountain into a pass called "Smugglers' Notch." They had a rough scramble, but found it very interesting, and reached the hotel late in the evening. The balance of the party came down the mountain road, reaching the house at tea-time. Smugglers' Notch was found so interesting that about half of the party went the next day, and all were agreed that the notch equalled and possibly exceeded any in the White Mountains in point of grandeur. The notch extends for a number of miles, and the pass is only wide enough at the bottom for a horse trail. Huge masses of rock lie scattered thickly about, and trees of large growth fill the whole bottom. The sides of the mountains that form the pass are very ragged and precipitous, from the immense masses of rock that have fallen to the pass below. The party spent the afternoon in viewing the place, and were much pleased that they had not let the opportunity of seeing it go by.

On the afternoon of September 19 ninety-five members and friends left Boston for MOOSE HILL in Sharon, by the Boston and Providence Railroad. From Sharon Heights Station the party walked to the hill, a few riding. The day was fine, and a very good view was had of the surrounding country. Moose Hill is 530 feet high, and on a clear day no less than forty villages may be seen from its summit.

Friday morning, October 9, a party of sixteen left Boston for Weirs, on Lake Winnipiseogee, RED HILL being the objective point. Here they took the steamer for Centre Harbor, reaching the Senter House in time for a late dinner, after which a walk was taken to the outlook on Sunset Hill, and the glories of departing day watched from beneath the "Whittier Pine." Another party, of about twenty-four, left Boston the same evening, and passing the night at Lake Village, joined the others at Centre Harbor about 10 A. M. the next day, and with a portion of them took carriages for the base of Red Hill. A few walkers had left Centre Harbor soon after breakfast, and reached the summit about two hours in advance of the others. The day was fine, but distant views were somewhat hazy. All felt amply repaid for the trip, and enjoyed every moment of the time. Returning to the Senter House, half of the party returned to Boston the same day, while others remained several days. A hard rain and severe blow, a few days previous to the trip, had somewhat marred the beauty of the foliage, but there was still considerable color left.

**Officers for 1886.***President.*

J. RAYNER EDMANDS, Harvard College Observatory, Cambridge.

*Vice-President.*

GEORGE C. MANN, Jamaica Plain.

*Recording Secretary.*

ROSEWELL B. LAWRENCE, 23 Court Street, Boston.

*Corresponding Secretary.*

CHARLES E. FAY, Tufts College, College Hill.

*Treasurer.*

GARDNER M. JONES, Post Office Box 2114, Boston.

*Councillors.*

*Natural History*, WILLIAM M. DAVIS, Cambridge.

*Topography*, ALFRED E. BURTON, Massachusetts Institute of Technology, Boston.

*Art*, CHARLES W. SANDERSON, 20 Beacon Street, Boston.

*Exploration*, WILBUR B. PARKER, 250 Marlborough Street, Boston.

*Improvements*, ISAAC Y. CHUBBUCK, 971 Tremont Street, Boston.

**Members added since July 1, 1885.**

Adams, Miss Harriet A., Somerville.

Bacon, Miss F. M., St. Louis, Mo.

Bailey, Frederick, Lowell.

Bowditch, Miss Charlotte, Jamaica Plain.

Brooks, S. G., Roxbury.

Brown, Ellis Y., Philadelphia.

Burleigh, H. P., Cambridge.

Callender, Miss A. J., Dorchester.

Chapin, Miss Anna G., West Roxbury.

Clark, F. W., Boston.

Clarke, Mrs. T. W., Roxbury.

Codwise, Mrs. Beatrice, Wellesley Hills.

Corson, Miss Juliet, New York City.

Crosby, James Allen, Jamaica Plain.

Crozier, Thomas, Charlestown.

Curtis, Miss Elizabeth, Boston.

Curtis, Miss Ida M., Boston.

Curtis, Mrs. Mary A. H., South Boston.

Cushman, Miss Ada L., Cambridgeport.

- Davis, Miss Carrie E., Brookline.  
Day, Albert A., Melrose Highlands.  
Day, Mrs. Albert A., Melrose Highlands.  
De Long, Rev. Henry C., Medford.  
De Long, Mrs. Louise G., Medford.  
Elliot, George W., Boston.  
Elson, George H., Boston.  
Fabens, Miss Caroline H., Marblehead.  
Ford, Miss Fannie M., Boston.  
Gleason, James M., Boston.  
Harriman, George B., Boston.  
Hatch, F. S., Hartford, Conn.  
Hayward, Miss Laura E., Malden.  
Hearsey, Miss Sarah E., Dorchester.  
Howe, C. Fred., Boston.  
Hubbard, Gardiner G., Washington, D. C.  
Jefferson, Miss Mary I., Boston.  
Jenkins, Miss Mary A., Boston.  
Josselyn, Miss Carrie E., South Boston.  
Kendall, Miss Jennie I., Dorchester.  
Larned, Charles, Boston.  
Loring, Charles W., Newton.  
Loring, Mrs. Charles W., Newton.  
Mears, John, Neponset.  
Mears, Miss Martha A., Neponset.  
Morrison, Mrs. L. A., Boston.  
Newell, Miss A. E., South Boston.  
Newell, Mrs. G. H., Roxbury.  
Nichols, Miss Mary, South Boston.  
Peabody, Miss L. G., Roxbury.  
Pearce, Miss Bessie, Roslindale.  
Porter, Ernest, Boston.  
Sampson, Miss E. L., Newton.  
Saunders, Miss Carrie H., Cambridge.  
Smith, Miss Frances A., East Boston.  
Stetson, Miss L. M., Boston.  
Thallon, Miss F. N., Brooklyn, N. Y.  
Thurber, Samuel, Roxbury.  
Tirrell, Miss F. R., Boston.  
Tirrell, Miss M. A., Boston.  
Titus, Rev. H. F., Newton.  
Turner, Miss T. W., Boston.  
Turpin, Bradford S., Dorchester.  
Turpin, Mrs. B. S., Dorchester.  
Waldron, Miss Elizabeth, Malden.  
Watson, Miss H. A., Boston.  
Wilson, Miss Myra I., Boston.  
Wilson, Miss Sarah W., Boston.  
Wingate, Mrs. H. F., Allston.  
Winslow, Miss H. A., Boston.  
Wooda, Solomon A., South Boston.  
York, Miss A. H., Boston.  
Young, Arthur, Boston.

# APPALACHIA.

---

VOL. IV.      BOSTON, DECEMBER, 1886.

---

No. 4.

## Ascent of the Matterhorn.

BY MELANCTHON M. HURD.

*Read February 10, 1886.*

ON the 10th of August, 1885, with my two younger sons, I made the ascent of the Matterhorn.

We came over to the Zermatt region, by the new Weissthor Pass from Macugnaga, accompanied by two guides, Clement Imseng and Joseph Lochmatter, recommended as careful, temperate, and experienced men. As we rested occasionally on our way, our chief guide Imseng, who had been twice up the Matterhorn, lauded that peak as one of the great things for us to do; and when it came into view at the top of the pass, he became quite enthusiastic about it.

Although it seemed to us a great undertaking, we could not but take kindly to the advances of our guide, being in the right temper for just such an adventure; for, beside some experience in mountaineering, we had gained robust health and great confidence in our powers of skill and endurance by a month's steady training among the peaks and passes of Tyrol, during which time we had made the ascents of the Gross Glockner and Monte Cristallo, two peaks which Mr. Utterson Kelso, the famous mountaineer, told us were "a most excellent preparation for the Matterhorn."

We had obstacles in our way at the very beginning; for soon after our arrival at the Riffel Hotel a heavy shower

came up, and as the clouds rolled away at nightfall, snow was disclosed, covering the sides of the peak, and rendering an ascent impossible until the sun should melt it or the wind blow it away. While we waited at the Riffel Hotel for our opportunity, we made some minor ascents, to keep ourselves in training and to get accustomed to our guides. Of these ascents, we went up the Riffelhorn one day, to the hut on the Theodule Pass another, and up the Breithorn and down to Zermatt on a third, taking up our quarters at the Hotel Monte Rosa.

To my mind there is no place, in either Switzerland or Tyrol, quite so fascinating and enjoyable as Zermatt. Here gather, with crowds of tourists, all the more celebrated mountaineers and famous guides, giving a most charming local color to the place. While waiting here, we met several persons who had made the ascent which we had in view, and who were quite ready to aid us with their experience. They gave us a general idea of the route, thought we would get but little sleep at the hut, spoke of dangers in the way in the shape of smooth rocks with a slender foothold and of steep ice-slopes, warned us that many of the ropes which had been attached to the rocks for safety were weather-worn and insecure, but finally ended by giving us all possible encouragement.

On the 7th we had another shower, and consequently more snow on the peak ; but on the 8th the sun came out bright and clear, and we could see the rocks grow black as the snow melted. A party of three Frenchmen, with three guides from Dauphiné, unacquainted with the peak, were attempting an ascent this day, over the fresh snow, and with a high wind blowing. As we saw them through the telescope, we could watch their slow and labored progress, and felt sure they would not accomplish their purpose. Late that night they returned to Zermatt, having been unable to reach the summit. This, however, did not discourage us ; but as there was still some fresh snow remaining, we engaged a third guide, Louis Zurbrücken, a very strong fellow, who knew the peak well, having made the ascent eight times.

As seen from Zermatt and the Riffel, the most prominent part of the Matterhorn is the northeast ridge. It is near this

ridge that the course lies, ascending first by the eastern face, and at the shoulder crossing to the northern side, but remaining close to the ridge until the summit is reached, 14,780 feet above the sea.

On the morning of the 9th our guides were out early, and announced that everything was favorable for the attempt; the snows were melting, there was a clear sky, and not a breath of wind. We made our preparations at once, had our shoes examined and new nails put in where wanting, looked after our provisions to see that we had a proper supply of the right sort, and at half-past one left our hotel at Zermatt for the hut where we were to pass the night, the guides carrying the bags of provisions as well as their ice-axes and ropes.

This hut, which is perched on a narrow shelf close to the east side of the ridge, about 10,500 feet above the sea, is almost on a level with the top of the great snow-slope on that side, as seen from Zermatt and the Riffel. It was built by Herr Seiler, the popular landlord of Hotel Monte Rosa, at his own expense. We were a little less than four hours on our way; our route leading over the meadows, through the larches, where our guides stopped awhile and took on a supply of wood for our use, then over low hills and a long ridge, ending with a stiff climb up the Hörnli rocks.

Arrived at the hut, the guides built a fire and commenced getting supper, while we went out on the ledge to enjoy the view, which takes in the Gorner Glacier in its whole extent, with the surrounding peaks, Monte Rosa, the Lyskamm, Castor and Pollux, the Breithorn, the Mischabelhörner, and others, the whole forming a striking amphitheatre of glittering ice and snow. As the sun went down we watched the shadows grow in the valleys and creep up the hillsides, and then we saw the beautiful after-glow on Monte Rosa, the whole mountain-top being suffused with a rosy hue.

We ate a hearty supper, and had a pleasant social chat with an Englishman who, with two guides, had just arrived and was to share the hut with us; and afterward we were rather interested in watching our guides as they stood on the platform smoothing the loose straw as evenly as possible and spreading some coarse blankets upon it. This platform,



which fills half the room, was to be our bed for the night, a further supply of blankets being furnished us as a covering. We turned in early, after going out to see the shooting stars, and were just falling asleep when we heard a succession of jodels coming from the rocks above. It announced the arrival of an Italian gentleman, who with two guides had come over the peak from Breuil.

At half-past two in the morning the guides called us for breakfast. We had little appetite, but enjoyed the hot coffee. When we went out on the ledge it was very dark and still, while the evening before the wind seemed to be rising, which had alarmed us somewhat. At ten minutes to three we started, Imseng leading and carrying a lantern, while we followed in the darkness over the rocks as best we could.

It was in that darkest hour which comes just before dawn, and it seemed darker to us from the contrast with the great white glaciers spread out below us. The air was fresh without being cold; we had slept well upon our bed of straw, and were only too eager for the work before us, and ready to meet any difficulties in the way. We were all very quiet, it seemed so weird at that early hour; besides, our thoughts were busy with the new experiences that were to come to us. Twenty minutes later a halt was called, the route becoming difficult; but as soon as it was light enough, we prepared for the real work of the day. The ropes were uncoiled, our party divided into two sections, and we were then roped together, to remain so, I may add, for eleven hours.

The Englishman and his guides started ahead. Zurbrücken went next, with my elder son; Imseng, my younger son, myself, and Lochmatter bringing up the rear. Each guide carried a bag of provisions and an ice-axe, — the latter attached to his wrist by a loop, that he might have free use of his arms, — while we put a bit of bread, a few dried prunes, and some cakes of chocolate in our pockets.

At starting we bore off to the left along the east face, and soon came to our first ice, an arm of the Furgen glacier, an exceedingly steep place, which we crossed horizontally, our guides cutting the steps with great care while we went along slowly, thrusting our alpenstocks into the hard ice at every

step. After going a short distance we reached another and much longer arm of the same glacier, which we went up easily in steps cut in the smooth ice, our route often following along close by overhanging rocks and around some difficult corners. In this rock-work, needing both our hands, our alpenstocks were a burden, and we were glad to leave them behind until our return.

The whole east face of the peak is a chaotic mass, in places exposing huge scars where the rock has broken away, leaving sheer precipices, while piles of loose stones, caught in falling, lie scattered here and there. We had easy places often, where we could go along at a good pace, talk with each other, and enjoy the view; then we would come to a precipitous rock, up which we would climb on our hands and knees, the guide ahead steadying us with the rope; again we would work ourselves around a corner or through a narrow passage; and thus we had a constant variety of exercise, keeping every faculty of mind and body in full play. We rested seldom; nor did we depend upon our guides to aid us, other than to lead the way and to steady us with the rope in risky places.

We had one such place soon after leaving the ice, a corner or buttress of rock on the edge of a precipice which was almost smooth, a few crevices being all we could depend upon to aid us in passing it. Imseng worked his way along the face of the rock, clinging to it like a cat; and we followed, going one at a time, in the same fashion, Lochmatter in the mean time bracing himself on the rocks in a safe position, with the rope held taut, and in readiness to check any slip that might occur. I think the worst part was perhaps twenty feet or more, during which distance we depended almost wholly upon our arms for support, bearing nearly all our weight upon them, with our hands placed in the crevices, and our feet steadied here and there by an occasional slight bit of rock. We were too intent upon our work to give any heed to danger. It was soon over, and we were scrambling up the rocks again. In the mean time the sun was well up, and we had watched the shadows creep slowly down our own and the neighboring peaks, and below we could see the smoke curl lazily up from the Zermatt chimneys.

A good two hours of this sort of climbing brought us to some nearly perpendicular rocks, to which ropes were attached. The lower rope was unsafe, and we clambered up by the seams and crevices without its aid, our guide steadying us with our own rope to a ledge, from which we used the upper rope in one hand, clambering as before to the slight platform above, upon which the upper hut is situated, 12,526 feet above the sea. We found the door of the hut open, and the interior filled with ice and snow, the place having been abandoned for the past two or three years.

While resting here a few moments, we saw two parties on the snow opposite, who were on their way up the Breithorn; and although they were tiny figures, we could see them distinctly against the white background.

For an hour or more we were on the rocks again, when, bearing off to the right and going up a short snow gulley, we came upon the ridge, the crest of which we followed to the shoulder, where we rested for twenty minutes and took breakfast.

As we sat on the snow, at the edge of the precipice, we were in plain view from Zermatt, the Riffelalp, and the Riffelberg, and knew we were being watched with interest through the telescopes at these places.

Following up the shoulder, after our guides had left their packs, so as to be unencumbered, we kept, for a hundred yards or more up the ridge, over a sharp edge of ice, not more than a foot or two wide, and with a precipice on either side, reaching down 4,000 feet to the glaciers below. There were a few rocks jutting out, too sharp to hold any snow, and of slight help to us. We started along cautiously, and kept well apart, the way being so narrow that there was hardly foot-room, even after our guides had cut steps for us; however, we passed over with comparative ease, and being free from dizziness we could look down into the depths below without inconvenience.

We still went along the ridge, but upon the northern edge of it, the eastern side being impassable, and after a short time came to the foot of the great mass of precipitous rocks, more than two hundred feet in height, which forms the base of the cap, or final peak. Here both ropes and chains have been

attached, the ropes in lengths of perhaps thirty or forty feet, and the chains by their side, of half that length, leaving us to depend wholly upon the ropes for a portion of the climb. The chains seemed secure, but the ropes were doubtful; so we grasped a rope and chain together in one hand, while with the other and our feet we sought out any seam or crevice that would help us, the guide in advance steadying the one next him by the rope to which we were tied, and each in turn to the one following, as we would come to any slight ledge, giving support enough to furnish a foothold. If these ropes and chains had not been placed here, it would have been impossible for us to scale the rocks, and we should have been forced to follow the circuitous and dangerous route taken by Mr. Whymper on his first ascent.

Arrived at the top of these we breathed more freely, and soon came to the final ice-slope, perhaps four hundred feet high and lying at an angle of forty degrees or more. Each guide used his ice-axe either to cut or deepen the steps; and as we went plodding along, the ice-chips slid down on each side of us at a dashing speed and with a gentle hissing sound. There was a layer of fresh snow over the ice, with a thin crust upon it; and as we had no alpenstocks with us, we were glad to thrust our hands occasionally through this crust to help steady ourselves. It was a long pull, and we went on at a steady, even pace; but as we neared the top, we felt the enthusiasm of the moment, and increased our speed until the summit was reached,—a nearly level ridge about one hundred and fifty feet long, on one side fairly overhanging, on the other sloping like the steep roof of a house. We gave a few cheers, and looking at our watches found it was half-past eight, and that we had taken just five hours and a half from the lower hut.

While the rest of our party sat upon the snow, the Englishman and I seated ourselves upon a small pile of stones,—probably the cairn which Whymper and his guides had built on their first ascent,—and looked down upon Zermatt; then, turning our heads, we saw below us, on the other side, the village of Breuil and the green pastures of Val Tournanche. It was very quiet; and as the sun poured its warm rays upon

us through a cloudless sky, a large butterfly moved on lazy wing above our heads. I remember, too, that we breathed the rarified air of this high altitude as easily as that of the valley below.

We stood upon the soft snow, while our guides pointed out the chief peaks, many of whose forms were well known to us. It seemed as if the whole world, and that a world of mountains, lay at our feet. The atmosphere was so clear that we could see distinctly the long line of the Maritime Alps which fringe the Mediterranean Sea, one hundred and thirty miles away, while nearer the group of giants encircling us stood out with great boldness, Mont Blanc towering grandly above them all. From our isolated position we could take in the complete shape and form of our own matchless peak, and look down upon valleys which not only charmed by their loveliness but gave a superb foreground to a picture unexcelled for its magnificence. Amid such scenes we would have been glad to linger; but having the harder part yet before us, we prepared for our descent. In a moment we were in line, our positions reversed, Lochmatter leading, while Imseng, the more experienced guide, took his place behind.

We started off very slowly and carefully, down steps already cut; but Lochmatter swung his ice-axe from side to side, with a quick motion, recutting to make them more secure. It was like walking upon air, as we started down the ice-slope, our faces forward as the safer position, and with a grand view at our feet, to which we gave little heed, being too much occupied in placing our feet in the narrow steps and in keeping the rope well in hand.

We soon came to the precipitous rocks again. Though requiring some care, we went down them easily and quickly, grasping the ropes and chains in one hand, as we did on the way up. The most of our weight came upon these ropes and chains; but our guides watched us closely, holding the rope to which we were attached quite taut to steady us, while they took a position where they could check the least mishap. It was by the side of these rocks, to the westward, that the accident occurred on the first ascent in 1865. We viewed the place with melancholy interest, as our guides pointed it out to us.

We soon came to the narrow ridge which leads down to the shoulder. The snow had become soft during our absence, and would often move along with our feet, requiring extreme caution at every step. Imseng, holding the rope steadily, kept a close watch upon us, and stood ready to throw himself on either side of the ridge, as occasion might require. Passing this, we rested again at the shoulder long enough to finish our provisions, and then started along the crest of the ridge. The same measured tread down the carefully cut steps, with occasional rocks for footholds, brought us, after nearly an hour, on to the east face again. Here, just before reaching the upper hut, was pointed out to us the place where Dr. Mosely, on the 14th of August, 1879, after a successful ascent, with over-confidence in his powers, unroped himself, and, while crossing a projecting rock, slipped and fell two thousand feet down the eastern face.

As we went on and it approached midday, we were more and more in danger from avalanches of rocks, and our guides hurried us along, watching the side above with great anxiety, and often choosing places for our course under the lee of such projections as would shield us in case of falling stones. We had an hour or more of this unpleasant experience before we reached the Furglen glacier. In going down this, we kept closer to the overhanging rocks for shelter, and our course was more upon the sharp, irregular edge of the ice, which had shrunk away from the rocks and left a deep chasm between. This was the extreme upper edge of the glacier, and we could look down its full length, extending two thousand feet or more. Our route seemed very risky and hardly passable. Lochmatter commenced cutting steps on the edge, while I held the rope to steady him; then, paying it out as he advanced, I came down upon the ice and placed my feet side-wise in the steps, holding my alpenstock firmly thrust into the ice in one hand, and the rope in the other. It was a very disagreeable place, and the rocks overhung so far that we could get little aid from them. We did get an occasional foothold where the débris had fallen, and then we would take to the ice again, going thus for many hundred feet.

After crossing some rocks we came to another bit of ice,

which we crossed quickly, and pushing ahead with all our speed, we arrived back at the hut again, having taken just five hours and a half for our descent. Quickly unroping and going inside, we stretched ourselves upon the straw, feeling in just that happy state of fatigue when rest of body and mind is so enjoyable.

After a rest of an hour and a half, we started on our way again. We were full of gay spirits, and went along speedily, making many short cuts when we reached the meadows; and in less than two hours we came into Zermatt, arriving there at half-past five, and at six o'clock we were seated at the *table d'hôte* at Hotel Monte Rosa, enjoying a good dinner and receiving the congratulations of our friends.

---

### Camel's Rump and the Rangeley Lake Mountains.

BY ROSEWELL B. LAWRENCE.

Read October 13, 1886.

THOSE who have read the article in APPALACHIA, Vol. IV. No. 2, entitled "From the Sources of the Connecticut to the Rangeley Lakes," will remember that the goal of that trip was not reached; that the little party camped two nights close by the Camel's Rump, but were prevented by bad weather from reaching the summit. On leaving Rump Pond at the mountain's base, I resolved that although defeated that time, I should try it again.

Accordingly in September, 1885, after failing to secure a companion, I started from Boston alone. A night was comfortably spent at the Elmwood in Phillips, and a beautiful drive enjoyed thence to the village of Rangeley, — the "city," as it is called, — situated on the northern shore of Rangeley Lake, or Oquossoc, the upper and most eastern of the Rangeley chain of lakes. The sky was so clear that I was unwilling to wait three hours for the steamer, but hired a buggy and pushed on to the Mountain View House, which is well situated close by the outlet and near the foot of Bald Mountain.

Immediately after dinner I had a boy take me in a boat across the outlet to the foot of the path, and after an easy climb of an hour and ten minutes reached the summit. The top is large, flat, and well covered with good-sized trees. Several outlooks, however, enable one to enjoy the view in all directions, but in fragments. It is very beautiful, although inferior, I think, to the views from Aziscohos and Deer Mountains. Bald is, however, very accessible, while Aziscohos is quite out of the way, and Deer requires hard work. Mt. Washington, the king of all, was perfectly clear. To the right of the Presidential Range were more distant summits, perhaps the Twins. Second in interest to Mt. Washington came Aziscohos, rising in the west with its double summit, beyond the lakes, but not far distant. On that mountain I had camped the year before, waking in the morning to find the lakes obscured and the top of Bald floating like an island in the sea of mist. In the northwest was Deer, just beyond Cupsuptic Lake, — a fine mountain and a great temptation to an Appalachian. My eye, however, did not stop till it rested upon the goal of my journey, — the Camel's Rump, in the north-northwest. It stood out clearly against the horizon, presenting a fine view of its steep southern slope. Among the many other interesting mountains were Kennebago in the north, Bigelow in the northeast, and Saddleback in the east.

The greatest charm of the Bald Mountain view is the beautiful lake scenery. Oquossoc is at the mountain's base on the east, and Mooselucmaguntic on the west, while parts of Cupsuptic and Molechunkamunk can also be seen. But with the exception of the lakes and the farms and village of Rangeley, the whole country is a wilderness.

I enjoyed a beautiful sunset, and then prepared my camp. The night was uneventful except for a slight sprinkle towards morning. The sun was two hours late in appearing, but finally shone forth brightly. The forenoon was spent in enjoying the blueberries as well as the view.

My aneroid barometer indicated just one inch difference between the base and summit of the mountain, representing less than 1,000 feet. I suppose the mountain's height above sea-level is about 2,500 feet, less rather than over. The



descent was quickly made, and took about forty minutes. I dined at the Mountain View House, and when the steamer arrived at three o'clock found my guide on board. We soon crossed the carry to Haines' Landing on Mooselucmaguntic Lake, and at four o'clock put off in a boat for Cupsuptic Lake and River. About half-way up the lake Billy Soule has a camp on an island. Heavy clouds in the northwest warned us to go no farther; so we stopped at the camp,—and fortunately, for it poured in torrents nearly the whole night.

The clouds the next morning did not interfere with our starting. A short row brought us to the head of Cupsuptic Lake, and it was two miles more to the falls in the river of the same name. We walked the half-mile carry, took a different boat above the falls, and continued up the river, about seven miles, in a general northerly direction, till we reached Camp Parmachenee at the eastern end of the Parmachenee Carry. The heavy rain during the night had raised the river so that the oars could be used nearly all the time, and the pole was needed but little. The vegetation was luxuriant, and the trip so delightful that I was loath to leave the boat and shoulder a pack. We were just two and a half hours going from Billy Soule's to Camp Parmachenee,—very good time. At the camp we ate our lunch, and at two o'clock started on the seven-mile tramp to Parmachenee Lake. The height of land on this carry is half-way across, and about 600 feet above the Cupsuptic and 450 feet above Parmachenee. The path is much used and is in very good condition. The tramp took us two and three-quarters hours. It seemed more than seven miles, and I really think it is more. A short row on Parmachenee Lake brought us to Camp Caribou, the paradise of the sportsman, far away in the Maine wilderness. The proprietor, John Danforth, gave me a hearty welcome, and suggested that I knew how to make myself at home. Danforth is the best man I have found in the woods, and his camp is a delightful place to stop. At first he built on a raft, until he obtained a lease of the island where he now lives. The building, or rather buildings, have been erected piece by piece, so that the result is quite fantastic and corresponds with the wildness of the scenery.

Danforth has several excellent guides, especially for hunters and fishermen. My guide, John Olsen, is one of the best, and as a woodsman and chopper is famous in that section of the country. A Norwegian by birth, he retains the good characteristics of his race. Honest, faithful in his work, and quiet in his habits, he made a good companion and an excellent guide. He considered me, however, an unusual specimen of humanity; and in fact I was an object of curiosity to guides, hunters, and fishermen alike. They all thought it strange that a man who did not care for hunting and fishing should come so far into the wilderness; and I wondered that they should sit in a boat or stand in mid-stream all day, or lie in tree-tops all night, and not care to enjoy the wild and beautiful views from the mountain-tops.

September 6 proved a cool day, fair, with heavy clouds. John and I took our boat, and, rowing to the head of the lake and up the Magalloway River, arrived in fifty minutes at Little Boys Falls. Pulling our boat over the rough ways, we started again, rowing or poling according to the depth of the water, until we reached the first east branch. Beyond this point the river was filled with logs, which had been cut several miles above, and had stuck in the river because the spring freshet had not been heavy enough to float them to Parmachenee. Had it not been for these logs, we could have continued in our boat to the base of the Camel's Rump, and thus accomplished our journey much more easily. There is an old tote-road all the way from Parmachenee to Canada, and this we followed. It is in a very bad condition, and after a rain the traveller at times wades in mud and water, and at others pushes his way through wet raspberry-bushes six to eight feet high. After passing two dilapidated loggers' camps, we reached in a few minutes the small clearing opposite Rump Pond, about five miles from Camp Caribou.

The Camel's Rump was indeed before us, but we could see no more than I saw the previous year,—its base. We selected a site for a camp, and I made up my mind to remain a week, if necessary to accomplish my object. During the afternoon the clouds were slowly breaking up and disappearing, and at sunset I was rewarded by seeing the whole

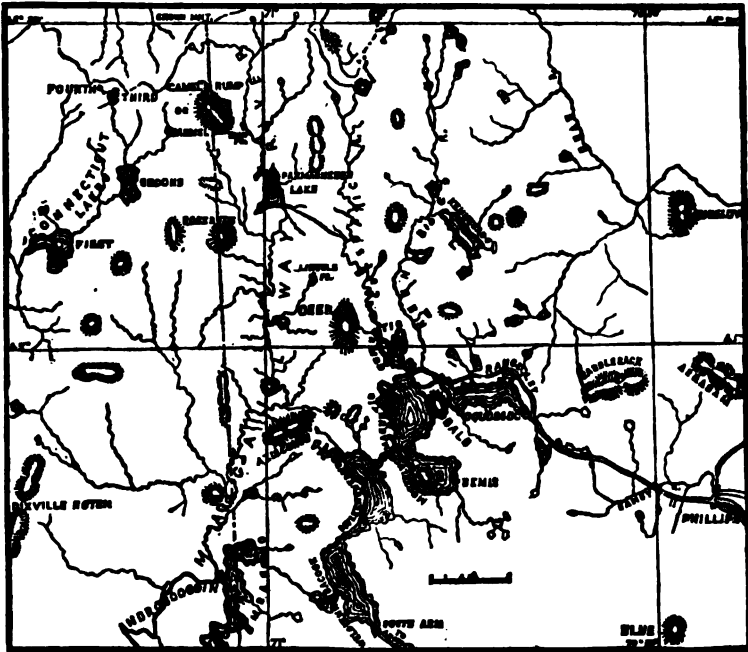
mountain from base to summit. It was not so wonderful, after all. The inclination of the southern slope was not what previous writers had described it to be. It was steep, to be sure, but nearly covered with trees, the ragged ledges appearing only here and there. Nevertheless, it was a beautiful picture,—the black river in the foreground, the pond and foot-hills just beyond, and then the rough mountain with its summit about two miles distant from us.

That night I stretched myself on the fir boughs before the fire, anticipating a glorious day on the morrow. The moon shone bright, and the temperature fell until the moist air, rising from the warm river, spread a gray mantle about us, obscuring the mountain, the moon, and even the river and trees. The frost-work the next morning was beautiful, every leaf being covered with the white crystals. At 6.30 A. M. the temperature was 33°, and the aneroid 28.37, indicating an elevation above sea-level of about 1,700 feet.

At 7.30 we crossed the river upon a raft which John had built the afternoon before, and started for the top of the Rump. After crossing some wet land we began to ascend, bearing to the right in order to climb a ridge which would lead us to the top. The plan worked successfully, and in two and one-half hours we reached the southern summit, and in ten minutes more the middle one, which is the highest point on the mountain. The whole ridge was once well covered with small trees. A few have been cut, so that one gets an unobstructed view east, west, and south. Going about ten rods north, I found a place where I could catch glimpses of Canada; and John, by felling a few trees, soon gave me a clear northern view.

For hours I studied the mountain peaks and enjoyed the scenery of forest and lake. The White Mountains were a little west of south; but Mt. Washington, sixty-five miles distant, was in cloud. The Presidential Range was seen nearly over a high ridge which John called Bull Ridge. Many of the Green Mountains were visible. In the north was Megantic, about twenty miles distant, forming one of the most striking features of the view. Of the boundary mountains none are worthy of special mention, except Double Head.

There are several fine mountains in the Ox Bow, much farther east. The Cupsuptic Mountains filled the east, the sharp summit of East Kennebago, east-southeast, being very marked. South-southeast were the Rangeley Lakes and Bald Mountain. Then came the symmetrical Deer, and finally the double-topped Aziscohos. This sketch can give only a faint idea of the numerous peaks, the billowy sea of gray and green. I do not remember a sign of civilization, but possibly farming-land



on the First Connecticut Lake was visible. The First and Second Connecticut Lakes were very beautiful, being only a few miles distant southwest, while northeast and southeast stretched the valley of the Magalloway, with the water of the river and its bogs and ponds showing here and there.<sup>1</sup>

<sup>1</sup> The map which accompanies this paper was taken mainly from the State map of New Hampshire, with more or less help from Captain Farrar's map, a map of the Magalloway by Mr. Charles L. Adams, also a map of the Rangeley Lake and Dead River Regions by A. W. Robinson, and from guides and personal observation.

The view from the Camel's Rump is interesting especially on account of the isolated position of the mountain and the wildness of its surroundings. It divides the waters of the Connecticut from those of the Androscoggin (Magalloway), and overlooks the sources of the St. Francis, Chaudière, and Kennebec (Dead River). It is distant from the Crown Monument—the common bound of Maine, New Hampshire, and Quebec—only about seven miles; and the boundary-line between Maine and New Hampshire passes over it just as it begins to slope to the west. Its position was determined by chaining south from the Crown Monument, that point having been determined astronomically by Colonel Graham under the treaty of Washington.

You will not find the "Camel's Rump" on the New Hampshire State map, but in its place "Mt. Carmel." I was much pleased, however, to notice that the popular name was used by the United States Coast and Geodetic Survey.<sup>1</sup> Dr. C. T. Jackson, in his final report on the geology of New Hampshire, 1844, gives the elevation of this mountain as 3,615 feet. Colonel Henry O. Kent, who perambulated the boundary in 1858, gives it as 3,711 feet. The latter, at least, is barometrical, and probably correct. It was adopted in the "New Hampshire Geological Survey," by Professor C. H. Hitchcock, 1878. The summit is just about 2,000 feet above Rump Pond and Parmachenee Lake, which are, therefore, about 1,700 feet above sea-level.

After spending six hours on the summit, we began the descent at 4.20. "Now for the southern slope," I said, and called to mind the description by Professor J. H. Huntington in the "Geology of New Hampshire." He says that the descent is almost perpendicular to the débris formed from the fallen rocks. My recollection was of a very steep slope, and such it proved to be,—steep, without being precipitous; nearly covered with trees, but very ragged. Some of the cliffs over-

<sup>1</sup> See Report of 1888: "Triangulation between the St. Croix and Hudson Rivers and Lake Ontario."

For further information concerning the name of the mountain and the geographical and physical features of the region, see the paper entitled "From the Sources of the Connecticut to the Rangeley Lakes," *APPALACHIA*, vol. iv. No. 2.

hung so that it was necessary to zigzag in descending, following down one shelf till a break allowed a descent to the next. The raggedness was increased by the great masses of rock which had broken from their strata and fallen to the lower shelves. On these shelves and among the rocks there is considerable vegetation and many trees, so that at a distance of two miles the slope appears to be covered with trees except in a few spots where the ledges and cliffs crop out. After the leaves fall the slope must look very bare and rough.

Probably the same geological structure continues to the mountain's base; but as we made slow progress, and were going too far to the right, we concluded to take a more easterly course. After some travelling we came to logging operations which we had crossed on our ascent. Knowing that the logging-road would lead to the river, and wishing to escape the swamp we had crossed in the morning, we followed the road, and struck the river at a place about a mile above our camp. Crossing upon the logs, we continued our tramp on the left or east bank. Again we had a clear evening, cold night, and foggy morning, the temperature at six A. M. being 35°. We returned to Camp Caribou the way we came. The next day was stormy, and I could but congratulate myself as I joined the circle of senators, plenipotentiaries, authors, and guides around the large fire. Conversation was not confined to fishing and hunting, but included politics and economics; the whole was seasoned with some of Danforth's matchless stories.

The morning after the storm the sky was perfectly clear, the rain having cleansed the air of all impurities. John and I started in our boat at nine for Bosebuck Mountain, situated about two miles southwest of the lake. We landed at the head of Bosebuck Cove, and then pushed on to the mountain, the summit of which we reached at quarter past twelve. The mountain is said to have derived its name from a hunting adventure; a buck having been run down on the mountain's side by a dog named Bose. I estimate the summit to be about 1,500 feet above Parmachenee, and 3,200 feet above the sea. It is covered with a good-sized growth of timber, which necessitates some climbing to secure views. First, however, I

found a lookout south where, by shifting my position several times, I was enabled to sketch a quarter of the horizon. The view of the Presidential Mountains was like that from the Camel's Rump, except that Mt. Washington was clear. Aziscohos was more interesting than when seen from the Rump, because it was several miles nearer. After enjoying this view, I strapped on my climbing-irons and walked up a tree, thus obtaining a fine view of Magalloway Mountain and the intervening ridges, and especially of the Camel's Rump. To enjoy this latter view was my object in climbing Boseuck, and I felt well repaid. There was nothing between us and the mountain, except a low ridge called Prospect Hill, which gave the forest an undulating appearance. The steep southern slope of the Rump directly faced us, and the steep eastern slope was outlined against the sky. The Camel's Rump is quite long, and runs northwest and southeast; the middle summit is the highest. The sag between the southern and middle is slight, and the distance about one third of a mile; while the other sag is deeper, and the distance greater. Megantic was behind the Rump, and therefore invisible. As Lake Parmachenee affords a good view of Boseuck, so the mountain commands a beautiful one of the lake, embosomed in the forest two miles to the northeast; it is, in truth, the gem of the Magalloway wilderness. The return to Camp Caribou took two and a quarter hours. The day had been perfect for mountaineering.

Having enjoyed the view from the Camel's Rump and a view of it from Boseuck, I was ready to set out on my return home. Deer Mountain, however, was on the way. My view from Aziscohos the previous summer had created a desire to climb Deer, and this wish had been strengthened by the views from Bald, the Rump, and Boseuck. I could find no one who had been on the summit of Deer; and of those who had been near the mountain, no two gave the same advice as to the best way to ascend. So I adopted Danforth's plan, and found his advice good, although, if I were going again, I should follow a course entirely different from what any one advised me. We left Camp Caribou about nine, rowed down the lake, crossed the carry, and then floated down the

Cupsuptic River as far as the falls. There at three o'clock we took an old tote-road to the foot of a spur which Deer Mountain sends out to the north. By this ridge we began to ascend about four o'clock; and the ascent through the heavy growth was so gradual that we were obliged to depend upon the compass, and several times John climbed trees to assure himself that we had not deviated from our course. At quarter-past six we camped well up on the side of the mountain, about 900 feet above the river.

A tramp of two and one-half hours the next morning brought us to the summit. It was thickly wooded, but by going a few rods north of the exact top I found a tree high enough to overlook all others. In the top of this I sat for two hours. At first the black flies bothered me, although it was the middle of September; but my guide kindly built a smudge at the foot of the tree and relieved me of the nuisance. I was rewarded for my toil, for there was spread before me the finest view northwestern Maine affords. Again I had a fine view of Washington; also Bosebuck, Camel's Rump, and Megantic near together, with a beautiful foreground embracing Lincoln Pond and Parmachenee Lake. Even Camp Caribou, twelve miles distant, was clearly visible. But the great charm was the view of the Rangeley Lakes to the south and east: Cupsuptic at the mountain's base; beyond, Oquossoc and Mooselucmaguntic, with Bald Mountain between them; while to the right was Molechunkamunk, and to the left Kennebago. The background of this beautiful picture was formed by the Kennebago Mountains, Bigelow, Saddleback, Blue, and the Grafton Mountains. I estimate the elevation of Deer to be over 3,500 feet, about 2,000 feet above Cupsuptic Lake, 1,000 feet higher than Bald Mountain, a few hundred feet higher than Aziscohos, and a trifle lower than the Camel's Rump. The best way to climb it, I think, would be to land at the northwest corner of Cupsuptic Lake, ascend the southern spur, and follow it to the summit. We descended the way we went up, reaching the tote-road in two hours, and the carry in one and one-quarter hours more. At half-past six we arrived at Billy Soule's camp, six and one-half hours from the summit.



## 304 CAMEL'S RUMP AND THE RANGELEY LAKE MTS.

Sunday morning I arose at half-past eight, after twelve hours of rest. It was another beautiful day, and a part of it was delightfully spent with friends who have a camp on the lake. At five o'clock I took the steamer "Metallic," and went with Captain Barker to the Upper Dam and thence to Camp Bemis. I was much pleased with the little village of log camps, and can recommend Captain Barker as an excellent host. Monday I went out to Phillips. Tuesday I ascended Mt. Blue by taking a carriage ride of an hour and a half, and climbing the mountain very leisurely in an hour and twenty minutes. Mt. Washington was again visible, but hazy. The farming country with its numerous ponds and villages was very pretty, but the chief attraction to me was the stately view of the Saddleback and Abraham Mountains. This is worth a journey in itself. I descended in fifty minutes, and then drove back to Phillips in one and one-half hours, — a very easy one-day excursion.

One may be inclined to ask whether this attractive region is available for a Club excursion. A camping-trip enabling a party to see what is here described would be practicable, but the magnitude of the task for a committee of arrangements is somewhat appalling. A few days could be spent by a party at that pleasant hotel in Phillips, the Elmwood, and day excursions made to Blue Mountain, Abraham, and Saddleback. The delightful trip from Phillips to Rangeley, or Oquossoc, Lake could be taken, together with the steamboat ride down to the outlet, where the Mountain View House is located. From this point Bald might be easily ascended. Then Moose-lucmaguntic Lake could be done on Captain Barker's steamboat, with his village of log camps as headquarters. Good climbers could also go up Deer Mountain. But to carry a party to Parmachenee Lake, the Camel's Rump, or Azischohos would require serious labor in planning and in execution. An August trip would be practicable only by camping from the outset, and the flies would be somewhat troublesome. Camp Caribou is filled with sportsmen until late in September. I have hope, however, that some year a party may be arranged for the last of September and the first of October, which is, after all, the best season of the year for the woods and mountains.

## Heights of the White Mountains.

BY EDWARD C. PICKERING.

DURING the summer of 1876 several thousand measurements were made of the altitudes of various points in the White Mountains. A brief description of this work has already been given in *APPALACHIA*, Vol. I. p. 138. The method of zenith distances was employed, the measurements being made by means of a micrometer level. This instrument consists of a telescope to which a delicate level is firmly attached. A micrometer screw serves to raise or lower one end of the telescope, the other end being attached to the base by a hinge. A further discussion of this instrument may be found in the "Proceedings of the American Academy," Vol. XI. p. 256; Vol. XXI. p. 268. Thirty-four stations, most of them mountain summits, were occupied with this instrument in 1876. Measures were made from each station, by directing the telescope to each mountain summit or other object of interest visible, and reading the micrometer screw. At short intervals during this work the instrument was levelled, and the screw again read. Horizontal angles were also measured in order to identify or locate the points observed. To determine the altitude of a given point above the instrument, we must know its angular altitude and its horizontal distance. For want of this last quantity the reduction of the observations described above has been delayed for several years. The preparation of the new Appalachian map of the White Mountains has furnished the means of determining these distances, and has accordingly been employed for this purpose. The horizontal angles have been verified at the same time, and in fact have served to locate many of the observed points. The danger of an error in identification has thus been greatly diminished.

The original readings of the micrometer screw were made to the nearest whole division of the divided head, — that is, to one hundredth of a turn. Later observations have shown that each division, which equals about 14'', should be divided into tenths, to attain the greatest accuracy of which the instrument is capable. The effect on the final result is not,

however, important on account of the presence of other sources of error. The most important of these are: First, variations in the atmospheric refraction; secondly, changes in the instrument, caused by variations in temperature, especially when it is exposed to the sun; thirdly, deviation of the point observed, from the true summit. In many cases the summits measured were wooded, the tops of the trees being observed. The mountains were seldom so flat or so near that a point below the summit would be sighted upon by mistake. This source of error would affect the horizontal angles much more than the vertical. It rarely happened that a signal had been erected on which all the pointings could be made. For ordinary purposes an error of a few feet in the height of a mountain is unimportant. To reduce the readings of the micrometer screw, three quantities must be determined: first, the combined collimation and level error of the instrument, which may be defined as the angle between the level and the telescope, or the inclination of the telescope when the level is horizontal; secondly, the correction for the curvature of the earth and the atmospheric refraction; thirdly, the angular value of one division of the micrometer screw. Each of these quantities may either be measured directly, or derived from the observations themselves. In the present case the latter method has been employed. A large number of reciprocal readings were obtained, since, in general, from each station pointings were made upon all the other stations visible. The difference between two reciprocal readings equals twice the sum of the first and second of the errors,—that is, the sum of the collimation, level, curvature, and refraction errors,—provided that these quantities are the same at the two stations. But the combined curvature and refraction expressed as an angle is nearly proportional to the distance between the points of observation, while the collimation and level errors are, of course, independent of this distance. A comparison of fifty-three pairs of reciprocal readings showed that the collimation and level errors were nearly equal to two divisions of the screw, and that the curvature and refraction equalled about one division for each kilometre of distance between the points of observation. The variation

for different stations did not appear to exceed the other sources of error enumerated above.

The angular value of one division of the micrometer screw may be determined from the observation of any point whose distance and height above the instrument are known. Observations were made between but few pairs of stations, both of which had hitherto been determined with sufficient precision. It was decided, therefore, to employ all pairs of observations which served to determine the height of any station from two others, one high and one low, provided that the height of these last had been determined by levelling.

TABLE I. — STATIONS OCCUPIED.

No.	Desig.	Name.	Vert.	Horis.	Cl.	Height.
1	—	Israel River Bridge . . . .	80	27	F	—
2	—	Plaisted House (piazza) . .	65	56	D	1396
3	—	“ “ (window) . . . .	241	67	D	1406
4	—	R. R. Bridge, Lancaster . .	43	43	F	—
5	—	Hill near Jefferson . . . .	32	31	F	—
6	E. 9.1	Bray's Hill . . . . .	105	107	D	1683
7	—	Jefferson Hill . . . . .	67	62	F	—
8	D. 16.1	Ball (Boy) Mountain . . . .	75	74	D	2233
9	D. 12.1	Starr King . . . . .	118	115	D	3925
10	E. 4.2	Owl's Head . . . . .	146	135	C	3270
11	F. 8.1	Mt. Adams . . . . .	223	215	B	5819
12	—	Mt. Pleasant House . . . .	40	34	E	—
13	—	Mrs. Pendexter's, N. Conway	71	57	F	—
14	—	Intervale Station . . . . .	20	15	A	549
15	P. 1.1	Kearsarge (N.) . . . . .	194	178	B	3270
16	F. 9.1	Mt. Pleasant . . . . .	123	109	C	4781
17	F. 6.1	Mt. Washington . . . . .	70	66	A	6293
18	F. 4.1	Mt. Jefferson . . . . .	260	208	C	5736
19	—	Twin Mountain House . . . .	64	53	F	—
20	—	Flume House . . . . .	18	20	F	—
21	I. ?	Mt. Pemigewasset . . . . .	76	70	D	2561
22	J. 6.1	Mt. Lafayette . . . . .	185	164	C	5269
23	J. 7.1	Mt. Liberty . . . . .	172	151	C	4472
24	M. 4.2	S. Doublehead . . . . .	139	111	E	—
25	O. 1.1	N. Moat . . . . .	200	184	B	3217
26	O. 1.4	S. Moat . . . . .	87	85	B	2788
27	Q. 1.1	Chocorus . . . . .	119	113	B	3508
28	—	Conway Corner Station . . .	27	24	A	466
29	M. 5.1	Thorn Mountain . . . . .	155	138	E	—
30	K. 4.1	Mt. Willey . . . . .	197	190	C	4313
31	—	Glen Station . . . . .	53	48	E	529
32	—	Bemis Station . . . . .	7	11	E	995
33	—	Upper Bartlett Station . . .	28	26	A	659
34	L. 14.1	Iron Mountain . . . . .	83	80	C	2736
35	—	Thorn Mountain House . . .	41	37	E	—

The various stations occupied are enumerated in Table I., which gives in successive columns a number for reference, the Appalachian designation, if any, for the station, its current name, the number of vertical and of horizontal angles measured from it, and a letter which designates the class to which it was assigned in the determination of its height. A indicates that the height was determined by levelling. B, C, and D refer to the classes described below in the determination of the heights of the occupied stations. E is applied to other stations whose positions have been found, but whose heights were not used in determining the heights of the other stations. F is applied to those stations whose positions have not yet been determined. The last column gives the height finally adopted for each station. A further description of the stations is given below.

1. The instrument was mounted on the rail of the bridge where the road from Jefferson Hill to Cherry Mountain crosses Israel's River.

2. Near the southern corner of the piazza on the floor of the parlors.

3. Window facing southeast of the room in the eastern corner of the second story.

4. Fifty yards northeast of the bridge of the Boston, Concord, and Montreal Railroad over Israel's River in Lancaster.

5. Ledge on the hill about two miles east of Jefferson Hill.

7. Rock on the hill-side behind Waumbek House, about five hundred feet above it.

12. Window over the front door in the second story.

13. Window-sill in the second story of the house two hundred yards west of Intervale Station.

14. The height of the rails at this station, as also of Nos. 31, 32, and 33, was furnished by the courtesy of John F. Anderson, Esq., Chief Engineer of the Portland and Ogdensburg Railroad Company. They have been diminished by five feet to reduce them to the sea-level at mean tide. The following elevations above mean tide are derived from the same source, and may be valuable for future reference: Line of Bartlett and Hart's Location, 744; Crossing of Sawyer's River, 860; Crossing of Nancy's Brook, 969; Water station at Cow's Brook,

1,455; Station for the Willey House, 1,607; Summit of grade at Crawford's Station, 1,902; Fabyan House, 1,571.

15. Two stations were occupied, as the house on the top prevented an unobstructed view.

17. Elevation determined by the United States Coast Survey (C. S. Report, 1870, p. 90).

19. A knoll between the hotel and railroad.

20. Window-sill in the Flume House facing east in the second story.

24. As trees partially obstructed the view from the top of this mountain, the Coast Survey signal had been erected a short distance from the summit. The station occupied was near this. Unfortunately the position of the signal had not been determined, and its location cannot now be found. As it could not be seen from a distance, reciprocal readings could not be obtained.

28. Elevation determined by levelling ("Geology of New Hampshire," Vol. I. p. 265).

29. As the summit of this mountain was wooded, three stations were occupied on it at some distance apart. For this reason it has not been used in determining the heights of the other stations.

31. See No. 14. Three stations were occupied, as an unobstructed view could not be obtained from either one. For this reason it has not been used in determining the heights of the other stations, although its own height was determined by levelling. The results derived from it by a preliminary computation were somewhat discordant, probably from the shortness of the horizontal distances of the stations observed.

32. See No. 14. Not used in determining the height of the other stations, although its own height was determined by levelling. Its position had not been determined when the computation was made, and No. 16 is moreover the only station visible.

33. See No. 14.

The height given for Mt. Washington, No. 17, is that of the Coast Survey bolt, which was covered by a cairn at the time these observations were made, and now has a tower

erected over it. It is assumed to be the same as the apparent height of the ground around the hotel. Sightings were also made upon the ridge of the hotel from ten stations, and on the top of the chimney connected with the steam-boilers from six stations. Giving weights proportional to the distances of the points of observation, these points were found to be, respectively, 86 and 41 feet above the points observed on the ground. The measures from Mt. Adams and Mt. Jefferson have the greatest weights. The intervals to be measured there equalled nearly half a turn of the screw.

Nine measures of the cupola of the house on Kearsarge (N.), No. 15, in like manner gave its height as 35 feet above the ground. This house has since been destroyed by fire.

Table II. contains the material from which the angular value of one division of the screw was determined. In two cases only was a direct measure made between two stations both of which had been determined by levelling. It seemed best, therefore, to include all those cases where the difference between two such stations could be determined by observations made to or from any intermediate station. Calling the lower, intermediate, and upper stations L, M, and N, respectively, all cases must be considered where LM and MN have been measured by the micrometer level, if L and N have been determined by levelling. The first and second columns of Table II. give the names of the lower and intermediate stations. The upper station was Mt. Washington in each case. In the third column *u* denotes that the observation was made looking up from the lower to the intermediate station, *d* that the observation was made in the opposite direction. When observations were taken from each of a pair of stations, two lines are given in the table, since the observations were made on different days and are wholly independent. The next two columns give the number of measures of the line LM, and the mean resulting differences in height, assuming from a preliminary discussion the mean value 0.227 for one division of the screw. The unit is such that this represents the fraction of a foot corresponding to one division of the screw at a distance of one kilometre. The next two columns represent the number of measures along the line MN, and the resulting difference in height. All

of these measures were made from M to N, and none in the opposite direction. The next column gives the difference in height of L and N as determined by levelling, and the last column but one gives the residual found by subtracting this difference in height from the sum of L M and M N given in the preceding columns. When several measures are made of the same line they are seldom successive settings upon the same object. They are generally either settings upon different points, as the ridges and bases of the hotel on Mts. Washington and Kearsarge, or they are settings taken at considerable intervals, other measures being made meanwhile. The final column gives the value of one division of the screw derived from each measure.

TABLE II.—FUNDAMENTAL ALTITUDES.

L.	M.	D.	No.	L M.	No.	M N.	Elev.	Res.	Div.
Conway Corner	—	u	4	5836	—	—	5827	+9	0.2274
" "	Adams	u	1	5351	3	470	"	-8	0.2268
" "	Chocorus	u	1	3040	2	2777	"	-10	0.2266
" "	Kearsarge (N.)	u	3	2814	8	3082	"	+19	0.2278
" "	N. Moat	u	1	2746	3	3076	"	-5	0.2269
" "	S. Moat	u	1	2319	1	3508	"	-5	0.2269
Intervale	Kearsarge (N.)	u	2	2705	8	3082	5744	-7	0.2268
" "	" "	d	1	2713	3	"	"	+1	0.2270
" "	N. Moat	u	1	2685	8	3076	"	+17	0.2274
" "	" "	d	1	2667	3	"	"	-1	0.2270
" "	S. Moat	u	1	2266	1	3508	"	+25	0.2280
" "	" "	d	1	2250	1	"	"	+9	0.2272
Upper Bartlett	Kearsarge (N.)	u	1	2599	8	3082	5634	-8	0.2269

The first measure in the table is a direct observation of Mt. Washington from Conway Corner. As no intermediate station was used the columns relating to M are left blank. A measure of Mt. Washington from Glen Station gave a residual of -8, and the resulting value of one division, 0.2268. The mean of the thirteen values given in the last column of the table is 0.2269, and this value would be somewhat increased if we give greater weight to the observations depending upon the greatest number of settings. The value 0.227, which corresponds to the angular value of 14."27 for one division of the micrometer, has therefore been adopted.

The heights of the intermediate stations contained in



Table II. are determined with considerable accuracy, since each of them has been compared directly with a station above, and at least one below, whose heights have been determined by levelling. These stations are designated as B in Table I. From Classes A and B the heights of several other stations may be determined; these form Class C. Class D in like manner is formed from A, B, and C. All the more important stations are included in this list, except Nos. 24 and 29, regarding which some uncertainty exists. Several of these heights, however, depend upon a small number of measures, and the accidental errors are likely to be increased by the fact that they are connected with the levelled station only through one or two intermediate stations. A second approximation has therefore been made by determining the height of each station in B, C, and D from each of the observations connecting it with the stations A, B, C, and D, adopting the values just found for the stations B, C, and D, and using the levelled heights of A. The mean of these gave a third approximation to the heights of these stations. A fourth approximation was made in the same way, but did not alter the previous values by a sensible amount.

The results of the successive determinations of the heights of the stations in Classes B, C, and D are contained in Table III. The successive columns give the number of the station, its name, the number of readings employed in the first approximation, the deduced altitude, the average deviation in feet of the separate results, and the probable error of the mean in feet. The correction required by the second approximation is given in the next column, a negative sign denoting that the first result appeared to be too large. The corrections required by the third and fourth approximations are given in the next two columns. The last four columns relate to the value of the height finally adopted. They give the number of settings, their mean result, the average deviations of the separate readings, and the probable error of the mean as indicated by the accordance of the individual values. The three classes B, C, and D are placed in successive portions of the table, and each is followed by a line giving the means of certain of the columns.

TABLE III.—HEIGHTS OF STATIONS.

CLASS B.												
No.	Name.	No.	I.	A. D.	P. E.	II.	III.	IV.	No.	Adopt.	A. D.	P. E.
11	Adams	5	5821	1.2	0.5	-2	0	0	27	5819	7.6	1.2
15	Kearsarge (N.)	17	8262	7.0	1.5	+9	-1	0	45	8270	11.0	1.4
25	N. Moat	6	8220	5.7	2.1	-2	0	-1	81	8217	10.1	1.6
26	S. Moat	4	2797	9.8	4.6	-9	0	0	20	2788	11.0	2.1
27	Chocorua	3	3513	5.0	8.0	-5	0	0	30	3508	8.2	1.8
	Mean	7.0	—	5.7	2.4	5.4	0.2	0.2	81	—	9.6	1.5
CLASS C.												
10	Owl's Head	8	3273	2.0	0.6	-2	0	-1	22	3270	5.2	1.0
16	Pleasant	11	4781	8.9	2.4	+1	0	-1	27	4781	6.9	1.2
18	Jefferson	6	5788	0.8	0.3	-2	0	0	24	5786	6.8	1.1
22	Lafayette	17	5271	13.1	2.8	-3	+1	0	81	5269	13.3	2.1
23	Liberty	8	4464	12.9	4.1	+9	-1	0	20	4472	11.7	2.8
30	Wiley	10	4311	14.2	4.0	+2	-1	0	21	4313	10.2	2.0
84	Iron	9	2741	12.4	8.7	-3	-2	0	10	2786	10.6	3.0
	Mean	9.9	—	9.2	2.6	8.1	0.7	0.3	22	—	9.2	1.8
CLASS D.												
3	Plaisted	7	1407	6.9	2.2	0	-1	0	7	1406	6.9	3.4
6	Bray	9	1634	6.8	1.9	0	-1	0	10	1633	5.3	1.5
8	Ball	10	2284	11.4	8.2	0	-1	0	10	2233	11.5	3.2
9	Starr King	15	8925	7.2	1.6	0	0	0	16	8925	5.9	1.2
21	Pemigewasset	6	2560	14.5	5.5	0	+1	0	6	2561	10.8	4.1
	Mean	9.4	—	9.3	2.9	0.0	0.8	0.0	10	—	8.1	2.7

An examination of this table shows that the successive approximations give a rapid approach to the final value. The mean values in feet of all the numbers contained in Columns II., III., and IV. are 2.9, 0.6, and 0.2. Another approximation would not change any of the adopted values by one foot. The total number of settings in the table is 357 and of stations 17, or an average of 21 to each station. The average deviation of the separate results has a mean value of very nearly 9 feet, and the probable error of a mean elevation is 2 feet.

To show the degree of accordancy indicated by Table III., the observations of one station, North Moat, are given more fully in Table IV. A number for reference is followed by the

number and name of each station serving to determine the height of North Moat, the resulting altitude, and the residual found by subtracting the mean value 8,217.

TABLE IV.—NORTH MOAT.

No.	Des.	Name.	Elev.	Res.	No.	Des.	Name.	Elev.	Res.
1	11	Adams	3258	+38	17	26	S. Moat	8220	+3
2	"	"	3224	+7	18	"	"	8214	-8
3	14	Intervale	3215	-2	19	27	Chocorua	8204	-18
4	"	"	3234	+17	20	"	"	8206	-11
5	15	Kearsarge (N.)	3194	-28	21	"	"	8204	-18
6	"	"	8208	-9	22	"	"	3216	-1
7	"	"	8205	-12	23	"	"	3221	+4
8	"	"	8205	-12	24	"	"	8229	+12
9	16	Pleasant	3231	+14	25	28	Conway Corner	8212	-5
10	"	"	3231	+14	26	80	Wiley	8208	-9
11	"	"	8209	-8	27	"	"	8208	-9
12	17	Washington	3216	-1	28	"	"	8235	+18
13	"	"	3222	+5	29	84	Iron	3228	+9
14	"	"	8222	+5	80	"	"	8210	-7
15	22	Lafayette	3232	+15	31	"	"	3210	-7
16	"	"	8207	-10					

Readings 2, 4, 7, 8, 11, 16, 18, 24, 25, 28, 80, and 31 were made upon North Moat from the station named in the third column. The other readings were made from North Moat. No. 5 was made upon the cupola of the house on Kearsarge (N.), and No. 12 on the ridge of the house on Mt. Washington. The first approximation of 8,220 feet, as given in the fourth column of Table III., was derived from Nos. 3, 4, 12, 13, 14, and 25.

Three series of observations were made from the Plaisted House. One, from the piazza, Station No. 2, included the greater portion of the view not cut off by Mt. Starr King. The second from the window, Station No. 3, included a large number of points upon the Mt. Washington Range. The third, also from Station No. 3, is the only one included in Table III. Eight series of observations were made, on seven different days, to determine the effect of the variations in the atmospheric refraction, and other sources of error. In all, 171 settings were made on twenty-seven objects. On taking residuals four were found to be discordant, and to give the values of + 10, - 6, + 11, and - 10 divisions of the micrometer.

Three of these occurred in the second series. All were probably due to errors of reading of the screw-heads, and were doubtless due to carelessness. Of the other residuals but one, which equals 3, exceeds two divisions. The average value of all the residuals is 0.86, or, rejecting the four discordant readings, 0.60. One division varies from two to seven feet, according to the distance of the object. Its average value is about 4.5 feet. A considerable portion of the remaining error is caused by neglecting the tenths of a division. Evidently, for the distances here employed, not exceeding twenty miles, the variations from day to day are inappreciable.

Table V. gives separate residuals for the seven occupied stations observed from the Plaisted House. The number and name of the station are followed by its distance in kilometres, the corresponding value of one division in feet, the mean reading, and the residuals found by subtracting this mean from the individual measures. The residuals are expressed in feet, negative residuals being indicated by *Italics*. The separate readings for Owl's Head would therefore be 9.31, 9.31, 9.32, 9.31, 9.31, 9.29, and 9.31. The last three columns give the deduced difference in height; the height of the Plaisted window, found by subtracting this difference from the adopted heights of the various stations given in Table III.; and finally, the residuals found by subtracting the mean height, 1,406, from the separate determinations.

TABLE V. — 3. PLAISTED HOUSE (WINDOW).

No.	Name.	Dist.	1 Div.	Rdg.	Resid.	Diff.	Elev.	Res.
10	Owl's Head	8.85	1.96	9.31	0010080	1846	1426	+20
11	Adams	17.85	4.05	10.71	002012110	4421	1400	-6
16	Pleasant	21.7	4.98	6.61	11210011	3376	1404	-2
17	Washington	20.97	4.76	10.11	061100	4921	1407	+1
18	Jefferson	17.50	3.97	10.72	00012107	4388	1401	-5
22	Lafayette	31.3	7.11	5.10	010122001021	3860	1408	+2
30	Willey	26.05	5.92	4.65	200011001	2915	1394	-12

It will be seen that the errors of the individual readings are far less than the systematic errors affecting the whole. Thus the separate values of the height as deduced from the settings

upon Owl's Head, are 1,426, 1,426, 1,424, 1,426, 1,426, 1,430, and 1,426, since one division equals 1.96 feet, and a positive residual denotes a large reading, and consequently a large difference in height of the two stations. As these values are all much in excess of those given by the other stations, it is probable that the assumed distance of Owl's Head is a little too great, or that some other similar error affects them all.

Where values had been adopted for the heights of the occupied station, the reduction of the various measures was easily effected.

The original readings of the micrometer screw were corrected for the position of the axis of the instrument and level, by subtracting the readings when the bubble was in the centre of the tube. A correction was at the same time applied for the inclination of the axis, when level readings in different azimuths showed that this was required. All these corrected readings were written in journal form, placing together all the observations taken from a given point. Ledgers were next prepared, which were formed while making the map, bringing together all the readings upon a given object, and entering the name of the station from which the observation was made, and its distance in kilometres and hundredths. The identification of the point was secured from the horizontal angle. The micrometer readings were next increased by two divisions, to correct for the collimation and level errors, and by a number of divisions equal to the distance in kilometres, to correct for the curvature of the earth and refraction. The distance in kilometres was next multiplied by 0.227, which gave the value in feet of one division of the screw, at a distance equal to that of the observed point. The product was then multiplied by the corrected micrometer reading, and gave the height of the observed point above the instrument. Adding to this the height of the station occupied gave the required height of the observed point. The simplicity of the operation is shown by the formula

$$A = 0.227 k (r - l + 2 + k) + B,$$

in which  $A$  is the required height,  $k$  the distance in kilometres,  $r$  the original reading of the micrometer,  $l$  its reading

when the bubble is level, and  $B$  the height of the occupied station.

The actual process is shown in Table VI., which gives the determination of the points measured on J. 3, Mts. Bond and Guyot. The figures are copied directly from the original computation, which was made nearly in this form. The successive columns give the number and name of the station from which the observation was made, the distance in kilometres, and the original reading after correcting it for the level. The next column gives the reading corrected for curvature, refraction, collimation, and level by adding to it two *plus* the number representing the distance in kilometres. The sixth column gives the distance in kilometres multiplied by 0.227, and equals the value in feet of one division of the micrometer head at that distance. The product of the fifth and sixth columns is given in the seventh column, after multiplying by 100. The next column gives the assumed height of the point of observation taken from Table I. The sum of these two, or the corrected height, is given in the ninth column; and the last column gives the residual found by subtracting the mean value from the individual values. This mean value is given in the heading following the name of each object observed.

Two additional measures were made, one from Mt. Pleasant, the other from Mt. Jefferson. The azimuth was nearly that of J. 3.4, but the altitude showed that a nearer point on the main ridge was probably observed.

TABLE VI.—Mts. BOND AND GUYOT.

No.	Name.	Dist.	Rdg.	Corr. Rdg.	1 Div.	Diff. Elev.	Elev. Base.	Elev.	Res.
J. 3.1. BOND. 4700.									
18	Jefferson	23.87	-2.16	-1.90	5.42	1090	5736	4706	-3
22	Lafayette	9.08	-2.79	-2.68	2.05	549	5269	4720	+11
"	"	"	-2.79	-2.68	"	549	"	4720	+11
25	N. Moat	28.53	+2.04	+2.34	6.36	1488	8217	4705	-4
26	S. Moat	30.83	+2.40	+2.73	7.00	1911	2788	4699	-10
30	Wiley	9.86	+1.73	+1.84	2.12	390	4812	4702	-7
"	"	"	+1.76	+1.87	"	396	"	4708	-1

TABLE VI. *Continued.*—Mts. BOND AND GUYOT.

No.	Name.	Dist.	Rdg.	Corr. Rdg.	1 Div.	Diff. Elev.	Elev. Base.	Elev.	Res.
J. 3.1 b. N. BOND. 4676.									
15	Kearsarge (N.)	35.42	+1.37	+1.74	8.04	1399	3270	4669	-7
18	Jefferson	23.80	-2.24	-1.98	5.40	1069	5786	4667	-9
22	Lafayette	8.84	-2.94	-2.83	2.01	569	5269	4700	+24
23	Liberty	9.68	+0.80	+0.92	2.20	202	4472	4674	-2
25	N. Moat	28.31	+1.96	+2.23	6.43	1468	3217	4670	-6
30	Willey	9.48	+1.68	+1.69	2.14	362	4312	4674	-2
"	"	"	+1.69	+1.70	"	364	"	4676	0
J. 3.2. S. GUYOT. 4588.									
15	Kearsarge (N.)	35.90	+1.25	+1.63	8.15	1328	3270	4598	+15
16	Pleasant	16.95	-0.72	-0.53	2.85	204	4781	4577	-6
18	Jefferson	23.19	-2.45	-2.20	5.26	1157	5736	4579	-4
22	Lafayette	8.56	-8.60	-3.49	1.94	677	5269	4592	+9
25	N. Moat	29.09	+1.75	+2.06	6.60	1360	3217	4577	-6
30	Willey	9.37	+1.15	+1.26	2.13	268	4812	4580	-3
"	"	"	+1.15	+1.26	"	268	"	4580	-3
J. 3.3. N. GUYOT. 4589.									
15	Kearsarge (N.)	35.70	+1.22	+1.60	8.10	1296	3270	4566	-23
16	Pleasant	16.64	-0.68	-0.49	3.77	185	4781	4596	+7
22	Lafayette	8.82	-8.43	-3.32	2.00	664	5269	4605	+16
25	N. Moat	28.99	+1.77	+2.08	6.58	1367	3217	4584	-5
26	S. Moat	31.87	+2.14	+2.48	7.23	1798	2788	4581	-8
30	Willey	9.10	+1.27	+1.38	2.07	286	4312	4598	+9
"	"	"	+1.25	+1.36	"	282	"	4594	+5
J. 3.4. — 4528.									
22	Lafayette	7.75	-4.80	-4.20	1.76	739	5269	4530	+2
23	Liberty	8.57	+0.19	+0.30	1.95	58	4472	4530	+2
25	N. Moat	29.20	+1.65	+1.96	6.63	1299	3217	4516	-12
27	Chocorua	31.07	+1.13	+1.46	7.05	1029	3508	4537	+9
J. 3.5. S. BOND. 4279.									
15	Kearsarge (N.)	35.75	+0.86	+1.24	8.11	1006	3270	4276	-3
22	Lafayette	8.55	-5.20	-5.09	1.94	987	5269	4282	+3
23	Liberty	8.53	-1.13	-1.02	1.94	198	4472	4274	-5
25	N. Moat	28.15	+1.35	+1.65	6.39	1054	3217	4271	-8
27	Chocorua	29.70	+0.84	+1.16	6.74	782	3508	4290	+11
30	Willey	10.58	-0.25	-0.12	2.40	29	4312	4233	+4
34	Iron	24.05	+2.56	+2.82	5.46	1540	2736	4276	-3

TABLE VI. — *Concluded.*

No.	Name.	Dist.	Rdg.	Corr. Rdg.	1 Div.	Diff. Elev.	Elev. Base.	Elev.	Res.
J. S. S. — 3904.									
18	Jefferson	26.10	-3.40	-3.12	5.92	1847	5736	3889	-15
22	Lafayette	8.50	-7.08	-6.98	1.93	1347	5280	3922	+18
23	Liberty	8.04	-3.23	-3.13	1.83	573	4472	3899	-5
30	Willey	11.20	-1.73	-1.60	2.54	406	4312	3906	+2

The heights of a large number of points were determined by the micrometer level. A portion of the readings has been reduced, some of the objects not having been identified, and the horizontal positions of others not having been determined as yet. Table VII. gives the altitudes of those points which have been determined by measurements from a sufficient number of stations to warrant their publication. The first column gives the Appalachian designation of the point, the second its name, and the third the number of stations from which the height is determined. The fourth column gives the mean value of the height, and the fifth its probable error as indicated from the accordance of the individual readings.

TABLE VII. — ADOPTED HEIGHTS.

Desig.	Name.	No.	Height	P.E.	Desig.	Name.	No.	Height	P.E.
D. 4.2	Pilot	5	3738	1	E. 4.2	Owl's Head	22	3270	1
6.2		8	4186	3	5.2 b		2	1836	0
11.1		8	3916	1	7.2	Dalton	2	2181	2
12.1	Starr King	16	3925	1	9.1	Bray's Hill	10	1633	2
12.3	" "	2	3632	1	F. 2.1	Madison	8	5881	4
12.3 b	" "	5	3325	2	3.1	Adams	27	5819	1
13.1		6	4046	4	3.2	"	4	5615	7
14.2		5	4033	2	3.3	"	3	5431	5
14.1	Pliny	3	3651	6	3.4	"	4	5386	6
16.1	Ball	10	2233	3	4.1	Jefferson	24	5736	1
18.1	Crescent	4	3322	3	5.1	Clay	9	5554	4
18.2	"	3	3246	5	5.2	"	5	5585	2
E. 1.1	Dartmouth	6	3768	3	5.2 b	"	7	5514	2
1.5	Mitten	2	3118	8	5.2 c	"	4	5507	3
3.1	Deception	7	3701	2	6.1	Washington	-	6293	-
3.2	"	4	3722	2	6.2	Boott's Spur	4	5529	4
3.3	"	4	3638	8	7.1	Monroe	6	5397	3
4.1	Cherry	9	3600	2	7.1 b	"	12	5375	6



TABLE VII. — *Continued.*

Desig.	Name.	No.	Height	P.E.	Desig.	Name.	No.	Height	P.E.
F. 7.2	Monroe	13	5216	3	K. 2.1	'Tom	6	4078	1
8.1	Franklin	6	4923	2	3.1	Field	11	4855	1
8.2	"	3	5013	3	3.2	"	2	3760	2
9.1	Pleasant	27	4781	1	4.1	Willey	21	4813	2
9.1 b	"	8	4499	3	4.1 b	"	5	4242	4
10.1	Clinton	7	4331	1	6.1	Nancy	9	3944	2
11.1	Jackson	7	4076	4	6.2	"	8	3742	2
12.1	Webster	7	3928	2	7.1	Anderson	8	3748	2
G. 2.1	Bald	5	3752	4	8.1	Lowell	7	3765	3
3.1	Moriah	4	4065	4	9.1	Carrigain	15	4701	1
5.1	Carter	4	4578	2	9.2	"	7	4276	3
5.2	"	5	4614	2	9.3	"	5	3886	4
5.3	"	8	4650	4	9.4	"	9	4435	4
5.3 b	"	4	4640	8	L. 4.1	Giant Stairs	4	3512	2
5.4	"	8	4468	1	5.1 b	Resolution	8	3486	1
6.1	Carter Dome	9	4856	4	6.1	Crawford	5	3180	5
6.2	" "	8	4711	3	8.2	Parker	5	3015	5
H. 1.1	S. Baldface	8	3590	2	9.2	Langdon	3	2439	3
1.2	N. Baldface	8	3608	2	14.1	Iron	10	2736	3
1.5	"	4	2954	2	M. 1.1	Wildcat	7	4323	8
1.5 b	"	5	2896	3	1.1 b	"	3	4334	2
2.1	Eastman	9	3559	3	1.2	"	5	4284	2
3.1	Sable	7	3877	4	1.3	"	3	4097	5
4.1	Royce	5	3117	4	4.1	N. Doublehead	8	3072	8
4.2	"	4	3219	5	4.2	S. Doublehead	5	2946	3
I. 1.1	Cannon	5	4107	8	4.2 b	"	5	2950	3
1.2	"	2	3898	7	N. 1.1	Hancock	6	3906	9
2.2	Kinsman	3	4377	7	1.2	"	6	4284	4
2.5	Pemigewasset	6	2561	4	1.3	"	4	4259	4
4.1	Moosilauke	13	4810	3	1.4	"	8	4434	3
J. 1.1	Hale	3	4102	7	1.5	"	5	4056	3
2.1	N. Twin	11	4783	2	2.1 b	Huntington	4	3731	3
2.1 c	" "	4	4028	2	2.2	"	4	3728	2
2.1 d	" "	5	4316	2	2.3	"	3	3820	8
2.1 e	" "	2	3808	0	4.1	Scar Ridge	6	3815	4
2.2	S. Twin	10	4922	2	4.1 b	"	4	3536	5
2.2 b	" "	3	4801	6	4.2	"	5	3816	4
2.4	" "	7	4741	8	5.1	Osceola	10	4204	7
2.5	" "	4	4632	8	5.2	"	12	4352	2
3.1	Bond	7	4709	2	5.4	"	7	4259	2
3.1 b	"	7	4676	2	5.5	"	8	4102	2
3.2	S. Guyot	7	4583	2	5.6	"	5	3651	2
3.3	N. Guyot	7	4589	4	5.7	"	5	3658	3
3.4	W. Bond	4	4528	3	8.1	Tecumseh	7	4008	1
3.5	S. Bond	7	4279	2	O. 1.1	N. Moat	31	3217	2
3.6	"	4	3904	5	1.2	Red Ridge	5	2787	5
4.1	Haystack, or				1.3	Bear Peak	5	2807	4
	Garfield	8	4520	3	1.4	S. Moat	20	2788	2
6.1	Lafayette	31	5269	2	2.1	Attitash	2	2516	0
6.1 b	"	9	5021	4	3.1	"	5	2985	3
6.2	N. Lafayette	8	5075	4	3.2	Table	4	2728	7
6.3	Lincoln	13	5098	2	3.4	"	3	2949	3
7.1	Liberty	20	4472	2	3.5	"	8	2953	2
8.1	Flume	6	3340	3	4.1	Bear	5	3267	4
11.1	Agassiz	6	2401	5	4.1 b	"	4	3271	2
11.2	Round Hill	4	2442	9	4.2	"	3	3225	2

TABLE VII — *Concluded.*

Desig.	Name.	No.	Height.	P. E.	Desig.	Name.	No.	Height.	P. E.
O. 4.3	Bear	3	3004	4	3.1	Passaconaway	9	4116	2
5.1	Silver Spring	8	3001	3	3.2	"	4	3402	6
6.1	Tremont	7	3399	4	4.1	Whiteface	8	4057	3
6.2	"	5	3307	8	4.2	"	7	4008	5
6.3	"	5	3010	5	6.1	Tripyramid	8	4189	1
7.1	Green's Cliff	4	2972	4	6.2	"	8	3684	5
P. 1.1	Kearsarge (N.)	45	3270	1	6.3	"	10	4155	3
1.2	Bartlett	6	2650	5	6.4	"	8	4189	2
1.5	"	3	2628	7	6.5	"	5	3935	3
Q. 1.1	Chocorua	30	3508	1	6.6	"	5	3908	3
1.3	"	8	3375	5	6.7	Kancamagus	4	3774	2
1.4	"	8	3354	3	8.1	Sandwich			
1.5	"	5	3287	5		Dome, or	5	3999	3
2.1	Paugus	7	3248	6	8.2	Black	5	3990	1

In the preparation of this table it appeared that numerous additional heights could be given if the height of Station No. 29 on Thorn Mountain was known. It was accordingly deduced from readings on fifty-four other points, most of them not occupied stations. The mean of these values was 2,283 feet, with an average deviation of 10.7 feet, and a probable error of 1.3 feet. This was adopted as the height of the station on the western ledge, and not of the top of the mountain.

To Mr. Edmands I am indebted for much assistance in relation to the horizontal distances and identifications involved in this work.

From Table VII. it appears that the principal group of the White Mountains is that culminating in Mt. Washington, 6,293 feet. It also contains Mt. Adams, 5,819; Mt. Jefferson, 5,736; Mt. Clay, 5,554; Mt. Monroe, 5,396; Mt. Madison, 5,381; Mt. Franklin, 4,923; Mt. Pleasant, 4,781; Mt. Clinton, 4,331; Mt. Jackson, 4,076; and Mt. Webster, 3,930 feet. The Franconia group contains Mt. Lafayette, 5,269; Mt. Lincoln, 5,098; Mt. Liberty, 4,472; Mt. Flume, 4,340; and Haystack, or Mt. Garfield, 4,520 feet. The Twin Range contains S. Twin, 4,922; N. Twin, 4,783; Mt. Bond, 4,709; Mt. Guyot, 4,589 feet. The Carter Range contains Carter Dome, 4,856; Mt. Carter, 4,650; and Mt. Moriah, 4,065 feet. The Whiteface Range contains Tripyramid, 4,189; Mt. Passaconaway, 4,116; Whiteface, 4,057; and Sandwich Dome (or, Black Mountain), 3,999 feet.

## 322 WAS CHOCORUA THE ORIGINAL PIGWACKET HILL ?

Of the other mountains, may be mentioned Mt. Moosilauke, 4,810; Mt. Carrigain, 4,701; Mt. Hancock, 4,434; Mt. Wildcat, 4,428; Mt. Kinsman, 4,377; Mt. Field, 4,355; Mt. Osceola, 4,352; Mt. Willey, 4,318; Mt. Starr King, 3,925; Cherry Mountain, 3,600; Mt. Chocorua, 3,508; Mt. Kearsarge (N.), 3,270; and N. Moat, 3,217 feet.

---

### Was Chocorua the original Pigwacket Hill ?

BY CHARLES E. FAY.

Read October 14, 1886.

IN a period of nine years there is ample time for any intellectual haze that has obscured substantial facts to clear away and reveal them truly; accordingly, if the views herein expressed differ in some points from those set forth in a former article to which the writer's name is appended,<sup>1</sup> no one will wonder.

It is a well-known fact that in colonial times, as early at least as 1725, there was an eminence, presumably within New Hampshire limits, known familiarly to Massachusetts rangers as "Pigwacket Hill." It lay to the northeastward of Lake Winnepesaukee, deep in the wilderness; for in those days civilization had passed but a little way beyond the northern boundary of eastern Massachusetts; even Nashua, then part of Dunstable, was a frontier town, and the fair intervals of Pennacook, the present site of Concord, were planted only by the red man. Not until 1726 did colonists settle here, and not until as late as 1763 did the settlement at Pennacook send out a colony to the then remote Pigwacket country, over sixty miles distant as the crow flies. The intervening distance was primeval wilderness.

But the region was by no means unknown. Occupied by more or less dangerous Indian neighbors, more than one

<sup>1</sup> APPALACHIA, vol. i. p. 152: "Concerning the True Name of the Northern Kearsarge."

expedition of rangers had been sent out to intimidate or to exterminate them. Most famous of these was the expedition of Captain John Lovewell, fitted out from Dunstable, in the spring of 1725, against the Pigwackets, whose chief village lay within the limits of the present township of Fryeburg, Me. Surprised by their intended victims on the shore of the pond that still bears the name of their leader, by the chief Paugus and his braves, a desperate encounter took place. A small band of the rangers only escaped with their lives; yet, on the other hand, so great was the destruction of life, and the fear inspired by the boldness of the whites, that the region was abandoned by its Indian occupants, and the way prepared for the advance of settlers up the Merrimac valley. Great was the fame of this important event. It was the theme on every tongue; it was sung by the colonial poets; it was even extolled by the Puritan clergy. The "Pigwacket Fight" shed a melancholy glory over the whole colony.

The geographical nomenclature of the region was of course at this time very meagre, for the most part only the Indian names — or what were taken to be such — of the different sections, and particularly of the streams and lakes. Mountains had not for these explorers the same interest as for members of the Appalachian Club; and if any of our familiar peaks of the White Mountain region had names as early as Lovewell's fight, they have not come down to us.

And yet there was one which for some reason was deemed important enough to have a name of its own, whether for its size, its striking appearance, its easily recognized identity seen from afar, or because it stood as a notable landmark for some interesting region. For one or for all of those causes, or else for some other that we cannot conjecture, it bore a name, — the suggestive, if not euphonious, title of "Pigwacket Hill."

How widely this name was known it is impossible to say. Indeed, we are only aware of its existence from a single contemporary mention; yet the way in which it is referred to permits the inference that it had a general currency among those interested at that time in the northern woods, and this category doubtless embraced all who realized that they had a scalp to lose.

This single mention occurs in a journal of Captain Samuel Willard,<sup>1</sup> who scouted with an adventurous band through the southern section of the White Mountains and through the Pigwacket region only a few months subsequent to Lovewell's famous fight. In descending the course of the Swift River, then called the Saco, the upper course of which it was represented to be on maps of much later date, he came at length to the place "where Capt. Lovel first come upon Saco, two days before his fight at the mouth of a stream which he followed from Pigwacket Hill."

Though this is the only place where the name occurs at this early period, the existence of the hill is posed as securely as if it were mentioned in a dozen journals, — its existence, but not its location. This "no man knoweth unto this day;" and yet perhaps some have cause to think that they hold the secret of its identity.

Of course, if one could determine the stream which Lovewell followed from Pigwacket Hill, it would be a long step toward the identification of the hill itself. So far as I know, this has never yet been attempted by any one who had not a point of argument to gain, and whose first thought was therefore to locate this unnamed tributary of the Saco (Swift) where it would do the most good, — to his side of the discussion, of course. Thus one disputant, ignoring the fact that Lovewell was coming from the south, and therefore could not *first* come upon Saco by following a stream which flows into it from the northeast, located its springs high up on the northern Kearsarge, and said the stream must be Artist's Brook, and hence that Pigwacket Hill was identical with the northern Kearsarge. His antagonist shifted its channel as many miles to the eastward, and brought it down a less ambitious slope into Lovewell's Pond, claiming the journal did not mean that Lovewell came upon Saco *at the mouth of a stream*, but that he came upon it *two days before his fight*, which was at the mouth of a stream which he followed from Pigwacket Hill. Hence Pigwacket Hill must be one of the three hills lying west of the pond, which, as if to confirm his argument,

<sup>1</sup> APPALACHIA, vol. ii. p. 336: "The March of Captain Samuel Willard."

do bear upon maps of a considerably later period<sup>1</sup> the name of "Pigwackett Hills."

It is not strange, perhaps, that the committee appointed to judge the evidence in the discussion, called upon to decide between these rival claims, should have accorded the greater weight to the latter; and yet the two are almost equally untenable. One sins against the laws of direction; the other as gravely against the laws which govern human moods and expression. What need for Willard to inform the Great and General Court, so few months after that soul-stirring event, that Lovewell's fight occurred at the mouth of a stream which he had followed from Pigwacket Hill, especially as it did not occur at that point, but a quarter of a mile distant from it? The topography of that battle-ground was too familiar to all<sup>2</sup> for such a blunder to be made or to pass unchallenged; and even if it had not been, such a digression from the strict line of narrative on Willard's part would of itself discredit this certainly ingenious interpretation. If time instead of place had been what he wished to state, he would naturally have said "two days before the Pigwacket fight."

Dismissing, then, these equally dubious hypotheses, let us study the words of the journal simply in their own light, determine, if we can, the stream at whose mouth Lovewell came upon the Swift River, and then settle, if possible, the more interesting question, What was the Pigwacket Hill of 1725?

Surely, if anything is known with regard to Willard's journey as he neared Pigwacket, it is that on that sixth day of October, when towards night they came upon the stream in question, they were nearly down to the confluence of the Swift and Upper Saco;<sup>3</sup> for they "discovered a river that came

<sup>1</sup> Jeffries' Map of New Hampshire, 1774, and others.

<sup>2</sup> By an error in the report of this paper in the Proceedings of the Club the author is unfortunately made to locate the fight at the confluence of this tributary and the Swift River.

<sup>3</sup> By the perversity of types, — the transposition of the numbers 2 and 3 in the notes on Willard's Journal, APPALACHIA, vol. ii. p. 843, — a most vicious error almost annuls the work of interpreting this part of the Journal. My only consolation comes from the very egregiousness of the blunder. It must furnish its own correction.

from the northwest into Saco [Swift] River," which the day following they explored with canoes for many miles. It is safe to affirm that no stream of that whole region, save the Upper Saco itself, will in any degree answer their description of this northwest branch.

Remembering, then, that Lovewell was coming up from the south, from his just-made fort upon Ossipee Pond, we need to look for some tributary of the Swift River flowing northward and joining it near its confluence with the Upper Saco. Such a stream exists, and all who have driven from Tamworth to Conway have followed it for some distance and crossed it here and there; even in the cars you may have noticed it a few miles below Conway Station. Small though it be, it bears to the Swift River the tribute of the watershed lying between the northern ridge of Chocorua and highlands in the northern part of the township of Madison and Eaton. It dallies in three ponds on its way, the last of which is to-day called Pequawket Pond. The stream itself still appears upon the map as Pequawket Branch! A westerly fork, if we may rely upon the State map, rises on the slope of Chocorua. By following no other stream could one make so direct a journey from Ossipee Pond to the Swift River. The direction, the embouchure, agree; even the name "bows" to us, as Malvolio would say. What possible objection to recognizing it as the stream which flows from Pigwacket Hill?

The next step we take more timidly. It would be too dogmatic to say that Pigwacket Hill of 1725 can be no other than the Chocorua of to-day, and yet this certainly seems very plausible. Surely there is in that region no candidate for the honor of being the first christened of our White Hills that can enter into competition with it. The present name probably does not date from before the time of the settlement of the region. Albany was not settled until 1766, and the neighboring town about the same time. The name of the hapless Chocorua was not probably bestowed till some years later. I find it first on the Sotzman Map of 1796.

Standing at the very portal of the Pigwacket Country, notably the most individual of New Hampshire mountains, its gleaming helmet of granite visible for scores of miles to the

southward, and seen plainly enough from Monadnock, from which summit, the year before, as we learn from an earlier journal,<sup>1</sup> this same Willard had descried Pigwacket in its proper bearing, — thus the most natural landmark for the scout or explorer, — it would surely be more strange if they had no name for it, than that it should have been the only christened peak north of Lake Winnepesaukee. We would hold our views with deference and diffidence, and to the question, “Was Chocorua the original Pigwacket Hill?” we merely reply with another, “Is not the presumption very strong in its favor?”

---

## Mountain Meteorology.

### PART II.

BY WILLIAM MORRIS DAVIS.

*Mountain Winds.* — The winds at altitudes reached by high mountains are of higher average velocity than those at lower levels, not only on account of the absence of friction with the ground, whereby the movement of the lower air is much retarded, but also by reason of the greater steepness of the baric gradients in the upper air, or, in other words, the greater inequality of pressure in a given high-level distance. We may be confident also that the winds on the higher mountain-tops are steadier than the lower winds, not only in velocity, but in direction as well; for all the seasonal, diurnal, and irregular (cyclonic) causes of the variation of winds from the mean annual direction and velocity find their maximum value in the changes of temperature and moisture near the land and sea surface; the clean, clear, thin upper air is little open to such changes. Finally, the winds of upper levels are prevailingly from some western quarter, even in those latitudes where the surface currents flow from the east, except very close to the equator.

<sup>1</sup> APPALACHIA, vol. i. pp. 154, 155.



Ferrel quotes the description by Piazzzi Smyth of the winds felt on the Peak of Teneriffe during his astronomical expedition to the summit of that mountain. While the surface winds prevail from the northeast in the summer and from the southwest in winter, the upper winds blow, as far as known, from the southwest through the whole year.

Captain C. E. Dutton found that the trade-wind was not felt on Mauna Loa and the other volcanic summits of the Sandwich Islands at a greater altitude than 7,000 or 8,000 feet; next above follows a zone of calm up to about 9,000 feet, and still higher there is usually a gentle wind blowing opposite to the trade. "Storms and gales of great power" from the southwest or northwest sometimes prevail on the highest summits; but there are no observations quoted to determine their frequency or their distribution through the year (U. S. Geol. Survey, fourth annual report, 1884, p. 145).

Many similar examples are quoted in books on meteorology.

The Signal Service Station on Pike's Peak (altitude 14,134 feet) is the highest meteorological station in the world, and now has records since 1873. The wind there has a mean hourly velocity of 20.3 miles for the year, rising nearly to twenty-five miles in the winter and falling to twelve in the summer. This is the highest mean value of all our stations, not excepting those on stormy coasts (Annual Report, Chief Signal Officer, 1884, p. 360). The winds are prevailing from the west. Mt. Washington (altitude 6,293 feet) has an average wind velocity of about thirty miles an hour; the direction is again generally from the west, but a reversal to easterly winds is not unusual during the passage of well-developed cyclonic storm-centres south of the mountain; the excess of velocity here over that on Pike's Peak is probably due to the cyclonic disturbances.

Professor Ferrel gives a table, constructed chiefly from deductive mathematical work, in which the eastward component of the wind at any altitude can be found over a broad range of latitude and for the opposite warm and cold months as well as for the mean of the year; its results accord very satisfactorily with those found by observation (U. S. Coast Survey Report, 1877; Meteorological Researches, p. 45).

The absence at high levels of both the "polar" and "equatorial" currents of the older meteorologists is as significant as the gradual vertical extinction of the lower cyclonic storm-circulation of more recent authors. It appears, on the one

hand, that the general planetary circulation of the winds, resulting from differences of temperature between equator and poles, is so far controlled by forces arising from the earth's rotation that the general direction of motion of its several members is rather along parallels of latitude than along the meridians; the more nearly north and south currents that Dove demanded in Europe and Maury popularized in this country, have no existence in the general motions of the atmosphere. On the other hand, rotary storms are found to be chiefly phenomena of the lower two miles of air; ascending to higher levels, where their fundamental differences of temperature greatly diminish and at last disappear, they fade away in the presence of the well-established westerly winds; the highest mountains probably know very little of the changes in wind-direction that storms bring. Mt. Washington is, however, not at this great height; here the observed direction and velocity of the winds about passing centres of low pressure are such that if considered with reference to these moving centres, the winds would blow in almost circular paths about them, as if in transition between the inflowing spiral curve of sea-level and the relatively outward spiral flow of the higher cirrus clouds. Thus Ferrel interprets the results obtained by Loomis (U. S. Coast Survey Report, 1880; *Meteorol. Researches*, part ii. p. 45).

Although the average velocity of the wind increases as we ascend, it is not unusual to find high-mountain winds for a time exceeded by those passing over an exposed coast station during a stormy week or month. Cape May, N. J., has thus oftentimes a higher monthly wind-record than Pike's Peak. In such cases, however, it is probable that the resultant movement of the lower wind in the line of its prevalent direction will be less than the corresponding resultant aloft; the large total movement of the lower wind is gained in its cyclonic agitation around centres of low pressure, whereby it flies actively back and forth, but without accomplishing as much forward progression as is gained by the slower but steadier high-mountain winds.

A more special characteristic of the upper winds is found in the occurrence of their maximum velocity at night, instead

of in the afternoon, as at the earth's surface. The explanation of the daytime increase of surface-wind velocities is found in one of Espy's early and brilliant generalizations in 1841; it was many years later independently rediscovered by Köppen, and is now generally understood to be due to a vertical interchange of lower and upper masses of air, caused by the gentle convectional circulation that is excited by the daytime warmth of the ground and made manifest by the growth of cumulus clouds. At night, when local convectional currents are absent, the lower air is more controlled by friction with the ground than by the ordinary baric gradients, or than by friction from the air moving above it; it therefore soon settles down to rest, and the resulting calmness of night-time is well known; but in the daytime, when the ground warms under sunshine faster than the air does, the convectional currents arise, and some of the upper, moving air comes down to replace that which ascends; when it reaches the ground, the morning breezes spring up, and grow stronger as the convectional interchange reaches greater altitudes and the cumulus clouds expand to their greatest height about noon and a little later. Just the reverse alternation might have been predicted in the velocity of the upper winds, but it was not thought of till found by Hellmann a few years ago. The general gradients which control the planetary circulation are not much affected by the diurnal variations of temperature in the lower air, and the upper winds might therefore move on steadily in their great circuits, were it not that in the daytime they have to expend part of their momentum in giving motion to the air of the ascending currents, which have no horizontal, progressive movement of their own; thus the velocity of the upper winds is checked in the warmer hours of the day.

Espy's original explanation is in his "Philosophy of Storms," 1841, p. 14.

Köppen's papers are in the *Zeitschrift für Meteorol.*, 1879, xiv. 333, and in the *Annalen der Hydrographie*, 1883, xi. 625. Hellmann's discovery was, to our discredit, made in his discussion of the published records of the Signal Service station on Mt. Washington ("Zur Physik der höheren Luftschichten," *Zeitschr. für Meteorol.*, 1875, x. 311), and had to wait a few years for its explanation.

Rotch gives a review of this question in the "American Meteorological Journal," 1885, ii. 29, and adds the following figures for Mt. Washington for the year 1884: mean hourly velocity at 11 A. M., 34.3 miles; at 11 P. M., 37.9 miles. Boston has, for the same year and hours, 11.5 and 9.8 miles. A comparison for several mountain stations is recently given by Pernter (*Zeitschr. für Meteorol.*, 1885, xx. 140-142.)

The violent daytime winds on the high plateaus, such as those between the Himalaya and Kuen Lun ranges, seem to discredit the statements just made concerning the nocturnal maximum velocity on mountains. The reason for the exception is found in the broad surface of the plateaus, and their great diurnal variation of temperature under intense insolation and unimpeded radiation, whereby the same variations in the velocity of the wind are caused as appear on lowlands, but in greater intensity. At night the air is very cold near the ground; its equilibrium is very stable, and friction soon destroys its motion; by day the lower air rises to a temperature of 50° to 70° F., or more, which is abnormally high for the altitude; the equilibrium is destroyed, and strong convectional currents spring up; and with them the daytime winds appear. On the dead-level plains of Tibet, 17,000 to 18,000 feet above sea-level, the frequent appearance of mirages described by Henderson demonstrates the unduly high temperature of the lower air, and about ten o'clock in the morning a wind arises from the west or southwest, increases to a hurricane in the afternoon, and then gradually subsides to a calm at midnight. Travellers have not unfrequently been killed by this wind, which at times is cold as well as violent. On the saline beds of extinct lakes, the wind raises clouds of dust that makes traversing them a dangerous undertaking (Lahore to Yarkand, London, 1873, 67, 77, 83).

The altitude at which there is the greatest daytime retardation of the upper wind, the intermediate altitude at which there is neither the retardation of upper levels nor the acceleration of the lower levels, and the changes of these altitudes with the seasons and the weather are matters of detail that still await discussion; the hills and mountains of New England offer good ground for such work.

The diurnal change in wind velocity causes a corresponding change in its direction. The modern theory of the winds, which takes true account of the deflective force arising from

their movement on a rotating sphere, leads one to expect that with increase of velocity there must also be an increase in the deflection from the line of the baric gradient,— to the right in our hemisphere, to the left in the southern. The morning retarded winds of mountain tops should therefore turn to the left as their velocity decreases, while the afternoon accelerated winds veer back again to the right, in this hemisphere. On lowlands the change of direction will be just reversed.

This result was discovered deductively by Sprung (*Meteorol. Zeitschrift*, 1885, i. 18); it has received good confirmation for several low-level stations, and for three mountain stations at least, Rigi-Kulm, Schafberg, and Schneekoppe; but Pernter (*Zeitschr. für Meteorol.*, 1885, xx. 175) does not find it well exhibited in the records of the high Swiss stations, and thinks they may be too high for its distinct appearance.

Thus far we have considered only such characteristics of mountain winds as belong to all high-level currents, and as indeed have been determined by observations on clouds. The great average velocity of cirrus clouds, their prevailing eastward motion even in the trade-wind zone, and their general independence of the cyclonic shifting of the lower winds and clouds correspond with the results obtained from direct wind measures on high mountains. There is next to be considered the peculiarities of those mountain winds that are excited by the mountains themselves, and that would arise even if all the rest of the atmosphere stood still.

*Mountain and Valley Winds.*— Mountainous regions are often characterized by winds blowing down the valleys at night and up the valleys in the daytime, thus forming a local current of diurnal period, commonly known as mountain and valley winds. At night the air is chilled by contact with the quickly cooling ground, and thus becoming heavier than the open air at the same level, flows down the slopes. If the configuration of the surface concentrate this sort of aerial drainage from a large upland area along a narrow valley outlet, a cool "mountain wind" of some violence may appear in its lower course. In the daytime the "valley wind" blows up-stream;

the cause of this is not so apparent, but it is thus explained by Hann: —



A C E represents the cross-section of two mountain ranges enclosing a large open valley, into which side valleys descend along the slopes A B and E D; it is up these side valleys that the winds of daytime blow. Suppose the morning air stand calm; then the level line A G E will be a line of uniform atmospheric pressure; it is the cross-section of a level isobaric surface, on which we may imagine the upper air weighing down, but on which there will be no motion, because the uniform gravitative weight acts at right angles to the surface of uniform resistance.

Now the ascending sun warms the ground and the air close to it; the air column B F expands to B J, C G to C K, and D H to D L; and the isobaric line is now A J K L E, no longer level, but sloping distinctly near the valley slopes. In this condition gravity urges the air from J to A and from L to E; and the currents thus formed, constrained by the mountain slopes, flow up the side valleys towards the passes and peaks.

This account of the theory of these winds is condensed from Hann's paper "Zur Meteorologie der Alpengipfel" (Wien. Akad. Sitzungsber., 1878, lxxviii. 2, 853). He refers to Saigey, who was the first to approach this explanation in his "Petite Physique du Globe" (Paris, 1842), and to Fournet of Lyons, who wrote an extended monograph "Des brises de jour et de nuit autour de montagnes" (Ann. de Chim. et de Phys., 1840, lxxiv. 337-401). The latter describes the day and night breezes of many valleys in southeastern France and western Switzerland; in the valley of the Maurienne, the up-stream day-breeze is more active in summer, and the down-stream night-breeze in the winter (359); the nocturnal wind called *Pontias* at Nyons, Department of the Drôme, fails to appear in the hottest summer weather and on cloudy nights, but in clear weather and in winter it is well developed, and has a greater extension down the valley (338). Saussure's observations on the *col* of Mont Cenis are also quoted, describing currents ascending either slope and joining in a vertical current over the pass (360).

General Strachey has written on these winds in the Himalaya; at most seasons of the year the winds blow up the valleys during

the day, from 9 A.M. to 9 P.M., and down at night; where the larger streams open out to the plains, the night winds blow out with great violence, particularly in the winter. They diminish in force as one ascends the mountains, and at great elevations on the high plains of Tibet the nights are almost always perfectly calm. The diurnal winds in the latter country — not “valley winds,” but ordinary daytime winds — are terrific, and the traveller there looks forward to the afternoon when these winds are at their height with real dread (*Journ. Roy. Geogr. Soc.*, 1851, xxi. 73). The same author elsewhere states that while the night wind is strongest at the outlets of the valleys, the day winds are most violent over the passes.

In Montana I have felt these night winds blowing with very unpleasant strength out of the Lower Cañon of the Yellowstone, which drains the wide basin of an extinct lake; and again at the narrow mouth of Boulder Creek, whose branches flow from a large area within the Big Belt Mountains. Many parts of our western mountainous country are well adapted to the development of these winds, of which one finds here and there brief accounts; but their specific observation has hardly been begun. In New England, mountain winds flowing down the deeper valleys of New Hampshire should certainly be found; the “hopper” of Greylock in northwestern Massachusetts is also well adapted to their formation, and the winds at its mouth may be commended as a subject for local observation.

When the mountain sides are snow-covered, the up-cast wind of the day is reversed into a cold, descending wind; for in this case, while the air lying on the slopes is not much warmed, a high temperature may be reached in the valley below; the air then ascends vertically over the valley, and is replaced by cold winds rushing down the adjacent snowy slopes.

Hann refers to a case of this kind described by Wagner in Ecuador. As the traveller approaches the snow-line of the great volcanoes that surround the plateau of Quito, a cold wind is encountered, blowing down the mountains with great violence, making the ascent difficult, if not impossible; the larger the snow-fields, and the broader and more barren the unclouded plains below them, the more regularly these icy storms appear: they blow by day and fade away at nightfall.

An apparently exceptional example of a daytime down-cast wind in the Upper Engadine is well explained by Billwiler of the Swiss Weather Service, and shown to be dependent on the very unequal slopes of the Inn and the Maira rivers to the north and south of the Maloja Pass. The Maira slopes steeply to the south, and has a strong up-cast wind which overflows the pass and overpowers the weak wind of the flat Inn valley ("Der Thalwind des Ober-Engadine," *Zeitschr. für Meteorol.*, 1880, xv. 297-302).

As a consequence of the normal valley and mountain winds, mountain peaks become clouded over about noon, and in the afternoon may receive rain condensed from the expanding, ascending current. At night the cold air collecting in the valleys often produces lakes of mist there that melt away under the morning sun; the air on the mountains is clearest and driest during the latter half of the night.

Espy gives the following letter from C. Williams, of Providence, R. I. (Fourth Met. Report, 1854, p. 202). From observations made during a stay of three weeks at Owyhee, in the tropical Pacific, in 1815, Williams says that every day, "soon after the sea-breeze set in, say about nine o'clock, a cloud began to form around the lofty conical mountain in that island, in the form of a ring, as the wooden horizon surrounds the terrestrial artificial globe, and it soon began to rain in torrents and continued through the day. In the evening the sea-breeze died away, and the rain ceased and the cloud soon disappeared, and it remained entirely clear till after the sea-breeze set in the next morning. . . . I was particularly struck with the phenomenon of the cloud surrounding the mountain when none was ever seen in any other part of the sky, and none there till after the sea-breeze set in in the morning, which it did with wonderful regularity. The mountain stood in bold relief, and from where the ship lay its top could always be seen above the cloud, even when it was densest and blackest, with the lightning flashing and the thunder rolling as it did every day. I passed up through the cloud once, and I know therefore how heavily it rains, especially at the lower side of the cloud. This rain never extends beyond the base of the mountain, and all around there is eternally a cloudless sky."

Junghuhn gives an admirable account of similar phenomena, uncombined with sea-breezes, in his work on Java. In the evening the sky is clear; after midnight mist begins to form, first in



the hollows, soon spreading all over the lowlands, and in the morning appearing like a great sea, broken only here and there by a reef-like tree-top. As the sun rises, the mist boils away in small cumulus clouds that soon dissolve, leaving the sky again clear about nine o'clock. But a little later, clouds begin to form on the mountain slopes, with their base at an even height, growing in the afternoon to heavy thunder clouds, yielding plentiful rain, while the sky over the plateau-valley is almost cloudless. As the sun descends and sets, the storm clouds dissolve away with magical rapidity, and the evening sky is cloudless as on the night before (Java, seine Gestalt, etc., Leipzig, 1852, i. 288, also 354). The original, from which this is much condensed, gives a very entertaining description of the regular repetition of atmospheric phenomena in this tropical island.

Parry makes brief mention of the regular afternoon showers on the Rocky Mountain summits in July and August, remarkable in their recurrence from day to day (Amer. Journ. Science, 1862, xxxiii. 236); but he attributes them to the mixture of ascending warm air with descending cold air, according to the older theories.

Hann describes similar changes in the Alps ("Die Nachmittagsgewitter in den Alpenthälern," Mittheil. oesterr. Alpenverein, i. 1863).

*The Foehn.* — A study of the effect that mountains produce on the winds that pass over their passes opens one of the most instructive chapters in modern meteorology, deserving a much more detailed treatment than can be given to it here. We may first describe the phenomena involved, and then briefly consider the history of their explanation.

First in Switzerland and afterwards in other mountainous countries, the attention of meteorologists was called to the occurrence, especially in winter time, of a warm, or even hot, dry wind, blowing briskly down the valleys from the high, cold passes. The Swiss name for such a wind is "Foehn," said to be derived from the old Latin name Favonius. Various local names are used in other countries, as will be seen below; but with the present understanding of the origin of the wind, all examples of it may be included under the Swiss term, which has now become of generic value. When the Foehn blows, it is common to see a bank of dark clouds over the pass at the head of the valley from which the wind

descends. Under its effects the snow-fields melt away, and the streams rise in freshets. Desor tells how at such times the Swiss peasants, having grass to cut on the upper pastures, will hasten there to work even at night, knowing that a single day of Foehn wind will dry the hay completely. The danger of fires in the villages is then so great that after learning wisdom by experience, the town of Glarus prohibited smoking in the streets during the blowing of the Foehn, and ordered extra precautions in regard to house fires. The relation of the high temperature and low relative humidity of the valley Foehn to the low temperature and high relative humidity characteristic of the mountain passes from which it descends, appear paradoxical at first sight, and have given rise to many theories and long discussion; and the history of the progress towards what may now be confidently called the true explanation of the wind presents an epitome of the transition from the old to the new school of meteorology.

Among the first explanations suggested for the Swiss Foehn, we naturally find one that gives it an origin in the Sahara. The great desert of northern Africa was regarded as a storehouse of all that is hot and dry, and winds blowing out from it were known to maintain their torrid characteristics even across the Mediterranean, giving southern Italy and Sicily the dry, enervating, dust-laden Sirocco, and Spain the corresponding Leveche, under whose influence a temperature of above 110° F. has been recorded at midnight! (To avoid confusion, it may be noted that the name Sirocco is applied in Italy also to a moist, cloudy, rain-bearing wind, and that the Spanish Leveche is often improperly called the Solano.) It was but natural to suppose that an extension of the dry Sirocco over the Alps would produce the Foehn, as long as the physical changes in ascending and descending currents were overlooked or misunderstood.

Desor and Escher von der Linth were prominent among the advocates of this old theory. They, together with Martins, of Montpelier, made an expedition to the Algerian Sahara, and returned convinced not only that the Foehn came ready made from the desert, but that the submergence of the desert in recently past geological time must have extinguished the Foehn, and thus allowed

the accumulation of snow on the Alps even to the production of the glacial period (Aus Sahara und Atlas, 1865, 40; "Die Beziehungen des Föhns zur Afrikanischen Wüste," Jahrb. Schw. Alpenclub, 1865, ii. 407-422). Apart from other objections to this theory, it is now known that only a small part of the Sahara was under water when Switzerland was under ice, and also that the still debated cause of the glacial period was not locally applied to the Alps alone, but was active over large and distant parts of the earth. Escher's statement may be found in a geological lecture delivered by him in Zurich in 1852 (Zwei geol. Vorträge, Zurich, 1852, 24).

The objections urged by Dove against the African origin of the Foehn are characteristic of the time when the local cyclonic circulation of the wind was unknown. He maintained that, on account of the deflective effect of the earth's rotation, an equatorial current moving from the Sahara could not reach southern Europe, but must fall on Asia Minor or Persia, and therefore that a warm wind on the Alps must be of western Atlantic origin; in other words, he saw only poleward baric gradients as a cause of winds, and looked on nearly all winds as members of the general or planetary circulation of the atmosphere. As an oceanic origin of the Foehn wind would imply a high degree of humidity, and as rain commonly fell on the south of the Alps when the Foehn was reported in the northern valleys, Dove went so far as to doubt the dryness that makes so characteristic part of its description by all local observers; and this gave rise to a serious controversy with the Swiss meteorologists.

Dove's writings on this wind are chiefly "Ueber Eiszeit, Föhn und Scirocco," 1867, and "Der Schweizer Fön," 1868. At this time, and even in his latest writings, he would not accept the views that Redfield had clearly expressed many years before concerning the cyclonic character of our alternating winds, — views that have found essentially universal acceptance since the establishment of the French and other weather services, and the publication of daily synoptic weather maps.

The dryness of the Foehn was completely established by the observations of the Swiss meteorological stations soon after

their foundation in 1868. At the same time the prevalence of moist, cloudy, or rainy winds on the other side of the Alps was also confirmed, and thus the warmth and dryness of the Foehn were demonstrated to be of local origin. The problem thus became more sharply limited: there was to be discovered why the wind appeared, and how its physical conditions were determined. The cause of the wind was soon found to be associated with the approach of a cyclonic storm or area of low pressure on its ordinary path from the Atlantic to central Europe; and thus the Foehn was seen to belong not to the general and permanent circulation of the atmosphere between equator and poles, but to the local, temporary, "accidental" disturbances of the atmosphere that we commonly call "storms." Wild, then of Zurich, now in St. Petersburg, was the first to bring out this important point in 1867 (*Der Schweizer Föhn*, Bern, 1868).

The origin of the wind should therefore be looked for not on the further side of the mountains, whence it blows, but in the direction towards which it flows; and in this view there is all the more need of finding a local origin for its physical conditions. Its warmth and dryness were first properly, but as will be seen not fully, explained as follows: When a current of air, moving on its oblique path towards a centre of low pressure, encounters a transverse mountain-range, and is forced to ascend over it, the air expands, and is thereby cooled, as has already been described; in consequence of the cooling, its vapor is condensed into cloud, and soon begins to fall as rain, so that on reaching the summit of the range the air contains less vapor, although it is very moist and cloudy; its fall in temperature has decreased its absolute humidity, while increasing its relative humidity. It must be further noted that on account of the release of the energy before employed in maintaining the rain in the state of vapor, the cooling of the ascending current is considerably retarded; the rate of cooling in an ascending mass of saturated air being only from one third to one half as fast as in non-saturated air. As soon as the current begins its descent on the leeward slope of the range, it is warmed by compression; but until all its cloud is evaporated it warms as slowly as it cooled before:

however, by reason of having lost some vapor that fell on the windward slope as rain, the cloud mass to be evaporated in descent is less than the total cloud mass formed in ascent; the descending current soon becomes clear, and then warms at the relatively rapid rate proper to non-saturated air, and as a consequence of warming faster than it cooled, it must reach the valley bottom as a warmer wind than it was on starting to ascend the other side of the mountains. Having lost some of its humidity and gained in temperature, it must be relatively dry; it is a Foehn.

To whom shall the high credit for this explanation be given? Like certain other broad discoveries, this is one that belongs to many independent students, and the Swiss meteorologists have traced it back even to the writings of one of their naturalists, Ebel, in the early years of this century. I have not seen his works. Dove also, in 1852, stated the general process fairly enough, but did not apply it directly to the case in hand, nor did he clearly state its effect on the relative humidity of the air (*Die Verbreitung der Wärme auf der Oberfläche der Erde*, Berlin, 1852, 3); and his other and later writings often present opinions so untenable that the leading Austrian meteorologist of our day has lately said, "It can hardly be questioned that Dove's utterly unphysical theories have for a long time retarded the progress of meteorology." Espy expressed similar views as early as 1841 (*Philosophy of Storms*), and again more definitely in 1857 (*Fourth Meteorol. Report*); in the latter year, after explaining the general principles of the process with great clearness, he said: "The theory also would indicate that during the great rains that take place north of the head of the Gulf of Venice and south of the Carnic Alps, there would be felt on the north slope of these Alps a very hot dry wind, such as the Sirocco is described to be" (*Ibid.* 153). Helmholtz made incidental explanation of the heat of the Foehn, but without mentioning its dryness, in his lecture on "Ice and Glaciers," in 1865 (*Popular wissenschaft. Vorträge*, 1876, i. 97).

Dr. Hann's first article on the Foehn appeared in 1866 ("Zur Frage über den Ursprung des Föhn," *Zeitschr. für Meteorol.* 1866, i. 257-263). He unconsciously repeats the explanations of his predecessors, but gives them better definition and carries them to a further application; for although he was then under the influence of Dove's theories of atmospheric circulation, he proved the local

origin of both the dryness and warmth of the Swiss Foehn, and moreover showed that a similar wind occurred in Greenland, descending from the plateau of inland ice, and therefore not possibly owing its warmth to the torrid zone. A still fuller account of the physical theory of the Foehn is found in his next article, a year after ("Der Föhn in den österr. Alpen," *ibid.* 1867, ii. 433); and a little later he added the crucial test of the theory in his account of a north Foehn wind felt in the *southern* valleys of the Alps ("Der Scirocco der Südalpen," *ibid.* 1868, iii. 561). If not priority of explanation, at least conclusiveness and completeness of discussion belong to Hann. Apart from its interest in a historical sense, this article offers so admirable an illustration of the truly scientific method of investigation that it deserves careful study by all who are fortunate enough to have access to it; unfortunately the periodical in which it was published is seldom found in this country. The observations employed were taken by Dürer, at Villa Carlotta, on Lake Como; for example, on Feb. 1, 1862, with north wind, the temperature was 71° F., and the relative humidity 12% in the afternoon; on the next morning the figures were 68° and 25%, respectively; similar warmth and dryness were felt in all the southern valleys of the Alps, but in the open plains of Lombardy they were hardly perceptible; at the same time there were heavy rains, with northerly winds, on the northern slope of the mountains. Although called a Sirocco, its correspondence with the Foehn is complete. The same article contains an important table presenting the rate of vertical decrease of temperature between pairs of stations of different altitudes on the windward and on the leeward side of the mountains. The average values are 0.48° C. and 1.00° C. per 100 metres, which agree wonderfully well with the values indicated by physical theory.

Only one element remains to be added to the explanation, but it is a significant one. Thus far the production of the Foehn depends on the evolution of "latent heat" while the wind is rising and raining on the further side of the range; now it appears from more precise observations that the winter Foehn is often felt in the northern valleys of the Alps a day, or even more, before any rain falls on the southern slope; and therefore, although the rain is an aid when it begins, it must in these cases be preceded by some other cause not dependent on the ascent of air towards the passes and the condensation

of vapor on its way. The solution of the difficulty is as follows: The average rate of variation of temperature in the atmosphere is closely one degree Fahrenheit to three hundred feet of descent. Inasmuch as the air is less active than the ground in changing its temperature, this rate will be increased in the summer season and decreased in the winter; in winter the rise of temperature encountered in descending through the air is generally less than the gain of temperature given to a descending mass of air by reason of its compression. If at such a time the air in a valley be withdrawn by flowing away in answer to the call of an area of low pressure, and its place be taken by air descending from the passes to windward, this simple fact of descent will require that the new supply of air shall be warmer than that which has moved away; it is necessarily very dry, because it gains capacity for vapor as its temperature rises, without gaining the vapor to satisfy its capacity. This is the first cause of the Foehn, and explains in good part why it is more pronounced in winter than in summer; its discovery is entirely due to Dr. Hann. When the wind over the pass is well established, it may be joined by currents of air rising from the further slope; these soon become cloudy and yield rain, and then the second cause of the Foehn is in operation, as already explained.

The need of the additional explanation was first shown clearly in an extended monograph by Dufour, of Lausanne, entitled "*Recherches sur le Foehn du 23 Septembre, 1866, en Suisse*" (Bull. Soc. Vaud., 1868, ix. 506-589). It gives an elaborate account of the hot, dry, violent southerly winds felt on the date mentioned in the northern valleys of Switzerland. Their warmth became distinctly perceptible on the 22d and continued over the 23d, and only then did heavy rains begin to fall on the higher passes. The diurnal range of temperature was small at most valley stations, and at several places the temperatures reached on the 23d were the highest of the year. After this there could be little belief in the desert origin of the Foehn, and one might think that the "latent heat" theory would also soon have received its needed supplement. But it did not for fifteen years, until Hann's discussion of the Foehn in Bludenz appeared (Wiener, Akad. Sitzungsber., 1882, lxxv. 2°, 416). This was based on a good series of observations kept at

Bludenz, in the Tyrol, where the Foehn is of frequent occurrence in strong development, and the demonstration of the two processes concerned in its production is so complete that there now seems to be nothing more to be said on the subject.

One point of contrast between the Foehn and the weather of winter anticyclones needs especial mention. It may at first sight seem indeed like blowing hot and cold with the same breath to refer both the warmth of the Foehn and the cold of anticyclones to a period of descending upper air; but it must be remembered, first, that the air in anticyclones settles down to the ground slowly, so that the heat produced by compression and perceptible at isolated points of considerable altitude is overcome by the cold produced by radiation and conduction to the excessively cold ground; and second, that the Foehn wind descends rapidly down the valleys, so that there is no time to overcome much of its gain of heat. Out on the open country, where it has travelled some distance with small descent, its peculiar characteristics are lost. Its motion is rapid, not only because the air current is concentrated by the configuration of the ground, but also on account of the strong gradients characteristic of the leeward slope of a mountain range, where easy motion of air and consequent equalization of pressures are greatly hindered by the mountain obstruction.

The literature of the Swiss Foehn is very extended. In addition to the titles already given, the following may be of value to the student of mountain meteorology: the last-named will lead him to many others.

G. W. RÖDER. Der Föhnwind in seinen phys. u. meteorol. Erscheinungen und Wirkungen. Wetterauischer Gesell. Jahresber., 1864, 1-32.

J. COAZ. Der Föhn. Chur Jahresber., 1867-1868, xiii. 89-111.

A. MÜHRY. Ueber den Föhnwind. Zeitschr. für Meteorol., 1867, ii. 385-397. This contains a review of the reports from the Swiss meteorological stations, in which the dryness of the Foehn, then in dispute, was demonstrated by systematic observations.

WETTSTEIN. Die Strömungen des Festen, Flüssigen und Gasförmigen, etc., Zurich, 1880, 332-366. An interesting chapter, giving several synoptic weather-maps during Foehn conditions in Switzerland, and statistical illustration of numerous examples.



The annual number of distinct Foehn winds in Switzerland is as follows: 1864, 11; 1865, 16; 1866, 19; 1867, 19; 1868, 14; 1869, 19; 1870, 17.

HANN. Einige Bemerkungen zur Entwickelungs-Geschichte der Ansichten über den Ursprung des Föhns. *Meteorol. Zeitschr.*, 1885, ii. 393.

Reference may perhaps also be made to a graphic explanation of the Foehn by the writer in *Science*, 1886, vii. 55.

G. BERNDT. Der Alpenföhn in seinem Einfluss auf Natur- und Menschenleben. *Peterm. Mittheil., Ergänzungsh.* 1886, 83. An extended review of the effects of the Foehn, with good illustration of the valleys in which it is most frequently felt, and of the general weather conditions in which it is formed.

As soon as it was perceived that the physical characteristics of the Foehn originated only during its descent from the Alpine passes, it became evident that a corresponding warm and dry wind should be found in other mountainous countries under similar conditions. Observation has abundantly proved this to be the case.

Espy seems to have been the first to recognize the wide occurrence of winds of this class. He quotes an extract given by Coffin in his "Winds of the Globe," from a letter from the Rev. Justin Perkins, residing in Persia, on the northeastern declivity of a high mountain. "About once a month, ordinarily, we have a strong wind, often violent, from the west, which is the simoom, or samiel, from the Arabian desert. It usually continues about three days; and though its noxious properties are much neutralized by its passage over a distance of hundreds of miles, and across the high, snowy Koordish mountains, it is still warm and often hot here, and very debilitating to men and animals, and it is often so dry and hot here as to wither and crisp vegetables." Espy did not accept the desert origin of this hot wind, but attributed it to a rainy ascending wind on the other side of the mountains (*Fourth Met. Report*, 1857, p. 147). His explanation of the warm wind in Switzerland has already been quoted; he mentions still other localities, the eastern slope of the Rocky Mountains among them, of which more below.

Dove's explanation of the warmth of a wind on the leeward side of a mountain range was also given as a general statement, not limited to the Alps; but he does not add definite examples.

The Föhn of Greenland, as represented by Hann from Rink's observations, is as extraordinary a wind as its relative in Switzerland, and possesses a special interest as being the first non-Alpine example of the kind presented in European writings. It is felt on the west coast, blowing from the east or southeast, and therefore flowing over the high ice-plateau of the interior, and down the deep marginal fjords; it comes after a calm marked by low pressure and high-floating clouds, and then begins suddenly with high temperature and transparent air, first whirling the snow on the highlands, and later descending to lower levels; the temperature rises from 20° to 34° or even 45° F. over the winter mean; the dryness is excessive, and the snow is evaporated from the ground without melting. (Hann, *Zeitschr. für Meteorol.*, 1866, i. 259; *Klimatologie*, p. 218. Rink's papers are "Beschreibung von Nord- und Südgrönland," *Zeitschr. für allg. Erdk.* 1854, ii. 207-210.) Hoffmeyer (*Le Föhn du Groenland*, Copenhagen, 1877) gives an admirable account of this wind. One of the best examples of its occurrence was during nine consecutive days in November and December, 1875, when it was as warm in western Greenland as in northern Italy, and warmer than in Canada, Iceland, Great Britain, and on the intervening Atlantic. At Upernavik it was warmer in the darkness of the polar night than at noon in France! No warm Sahara can here be appealed to as the source of the warm east-wind; its warmth is of local origin, by compression during descent from the icy plateau of the interior, moving in obedience to baric gradients about an area of low pressure at the mouth of Baffin's Bay, and high pressure near Iceland.

New Zealand has a pronounced Föhn wind, there called a "nor'wester," descending from the lofty New Zealand Alps that border the western side of South Island, and blowing out to the broad Canterbury Plains. When this wind sweeps over the snow-fields and passes, the creeping cumulus clouds disappear as by enchantment, the sky becomes a deep clear blue, and the valleys are filled with a descending current of hot wind; the rising of torrents from the melting ice-streams shows the effect of the wind (J. v. Haast, *Geol. of the Prov. of Canterbury and Westland*, New Zealand. Christchurch, 1879, pp. 198, 199. See also a description by O'Brien in *Haughton's Physical Geography*, Dublin, 1880, p. 102.)

The Chinook wind of the northwest, along the eastern foot of the Cordilleran ranges, has lately again attracted the attention that Espy

first gave it years ago (Fourth Met. Report, pp. 146, 147, 151). G. M. Dawson describes it as "a strong westerly wind, becoming at times almost a gale. . . . It is extremely dry, and, as compared with the general winter temperature, warm. Such winds occur at regular intervals during the winter, and are also not infrequent in the summer; but, being cool as compared with the average summer temperature, are in consequence then not commonly recognized by the same name. When the ground is covered with snow, the effect of the winds in its removal is marvellous, as, owing to the extremely desiccated condition of the air, the snow may be said to vanish rather than to melt, the moisture being licked up as fast as it is produced" (Science, 1886, vii. 33). Professor Loomis notes the following case of rapid temperature changes at Denver, Colorado, on the plains just east of the front range of the Rocky Mountains: "An area of low pressure passed over San Francisco January 14, about 4 P.M. During the following night the centre passed near Salt Lake City, and at 4 P.M., January 15, the centre was near Leavenworth, having travelled about 1,400 miles in twenty-four hours. It was this storm which brought the air from the west side of the Rocky Mountains over to Denver. The vapor contained in this air would be mostly precipitated on the west side of the Rocky Mountains, so that it would descend on the east side deprived of its moisture, and with a temperature above that which prevailed in the Salt Lake basin, on account of the latent heat liberated in the condensation of the vapor. . . . After the centre of low pressure passed Denver, the northeast wind returned and brought back the cold air which had constantly prevailed at stations not very distant. . . . Thus we see that in winter, during periods of extreme cold on the east side of the Rocky Mountains, when the temperature at Denver sometimes sinks more than  $20^{\circ}$  below zero, there prevails in the Salt Lake basin an average temperature of about  $30^{\circ}$ ; and when by changes of atmospheric pressure this air is carried over the mountains it may reach Denver with a temperature of  $50^{\circ}$ , resulting from a precipitation of vapor on the mountains. We thus find a mass of air having a temperature of  $+50^{\circ}$  in close proximity to a mass having a temperature of  $-20^{\circ}$ , and by the movements of the atmosphere attending the progress of a great storm these different masses of air may be brought successively over the same station, causing a change of temperature of  $50^{\circ}$  in a single hour." The following tables present numerical account of these changes from the same authority.

## TEMPERATURE AND RELATIVE HUMIDITY, JANUARY, 1875.

Date.	Hour. (Washington Time.)	Salt Lake.		Cheyenne.		Denver.		Pike's Peak.		North Platte	
		Temp.	R. H.	Temp.	R. H.	Temp.	R. H.	Temp.	R. H.	Temp.	R. H.
14	7.35	84°	61%	-11°	76%	-14°	100%	1°	100%	-13°	74%
	4.35	43	50	-1	68	-4	64	8	100	-6	61
	11.00	43	50	24	60	1	71	5	100	-11	76
15	7.35	32	84	28	67	48	21	6	100	-8	79
	4.35	26	52	5	75	10	17	12	100	-1	68
	11.00	23	78	-6	61	18	44	10	100	-4	64

Salt Lake, at the western foot of the Wahsatch Range, in the Great Basin, is constantly rather warm, and of ordinary humidity; Pike's Peak is cold and constantly at its dew point. North Platte, on the plains east of the mountains, is much colder, and distinctly dryer. Denver and Cheyenne are much alike in changes of temperature, as these stations are about equally distant from the eastern foot of the mountains; but Denver shows much the greater decrease in relative humidity, perhaps because the range west of this station is higher than farther north. The second table shows in greater detail how violent the changes of temperature were at Denver, and how completely they accorded with changes in the wind.

## TEMPERATURE AND WIND, DENVER, JAN. 14, 15, 1875.

Date.	Hour.	Temp.	Wind.
14	2.43 P. M.	-4	N.E.
	9.00	+1	N.E.
	9.15	20	S.W.
	9.20	27	S.W.
	9.30	36	S.W.
	9.35	40	S.W.
15	5.48 A. M.	43	S.W.
	13.30	52	S.W.
	12.30 P. M.	4	N.E.
	2.43	+10	..

An observer, who was considered perfectly reliable, "says that between 11 A. M. and noon a thermometer fell from 58° to 22° (that is, 36°) in five minutes" (Amer. Journ. Science, 1875, x. 12; 1880, xxii. 13, 14).

It is greatly to be desired that such studies as these shall be continued with the additional advantage of detailed and numerous local observations ; and the subject can be highly commended to the Colorado Meteorological Association, whose stations will be developed where the American Foehn can be studied to great advantage. The valley of Mono Lake, in California, east of the high Sierra, is probably visited by Foehn winds of pronounced character ; and the same should occur in Patagonia, along the eastern foot of the Andes. We see here the need of geographical exploration of meteorological phenomena.

*The Mistral and Bora.* — The stormy inversions of the atmosphere appearing in summer as thunder-storms and tornadoes are chiefly due to the excess of heat of the lower atmosphere, caused by long days and steep insolation, and favored by low, flat, dry lands. A kind of stormy wind at once related to and distinct from these appears sometimes in the winter, when the nights are long and radiation is in excess of insolation, so that the air upon plateaus is greatly cooled and the atmosphere becomes top-heavy. Summer convectional circulation arises from heating the air at the bottom ; winter convectional circulation may be produced by cooling it nearer the top. Mountain peaks and slopes do not allow the cooled air to collect upon them ; it drains away downward as soon as cooled ; but on a plateau the large surface of cooling ground not only exercises strong control over the temperature of the air upon it, but allows it to accumulate in considerable volume before flowing boisterously down the marginal slopes like an aerial cascade on the lands beneath. It will always be colder than the air that it displaces. Unlike the Foehn, winds of this kind may appear without perceptible gradients on the synoptic maps ; but a slight tendency to motion towards a region of low pressure may accelerate and intensify their action. Although not felt on high ground, they may be well included among mountain winds.

This explanation is based upon one by Baron F. v. Wrangell. In winter the air cools rapidly on the northern slope of the Caucasus mountains, and collects in a shallow depression behind the margin

of the littoral ridges at Novorossisk ; on the seaward side of the ridges and on the bay, the air is warmer, moister, and lighter. Now, if a slight baric gradient is formed, directed toward the sea, the cold air will be forced over the ridge-line, and then, in virtue of its density, will fall with accelerated velocity to the shore, as the tempestuous Bora. The author's calculations show that with admissible data the observed results can be quantitatively accounted for (" Ueber die Ursachen der Bora in Noworossisk," *Repert. f. Meteorol.*, v. 1876).

Sprung quotes from a Russian source an account of this Bora in the Bay of Novorossisk. Agitated clouds, increasing in size and number, appear on the mountain peaks, and squalls disturb the air below ; fragments of cloud plunge downward, dissolving on the way ; then the cold storm rushes down with inconceivable force, shaking buildings on its way, whipping first the shore-waters, and later the middle waters of the bay into foamy waves, and coating vessels with a salty ice-crust : but in the interior as well as at a moderate distance out from the shore it is only a faint breeze, soon fading away (*Lehrbuch der Meteorol.*, 1885, 188).

The Mistral, or Maestral, — the " master wind," — characterizes the low coast lands around the Mediterranean from the Gulf of Genoa to the mouth of the Ebro, and especially the valley and delta of the Rhone ; it is strongest in winter, when the highlands back from the coast are snow-covered and become very cold, and at this season is a very piercing wind, markedly in contrast with the warm sunshine of the clear air that it brings. A north wind may also occur, but with less intensity, and only by day, in summer in southern France, where the air on a barren district known as the Crau rises to much greater warmth than that on the neighboring highlands : but this should hardly be called by the same name. The true Mistral of winter is sometimes strong enough to throw railway trains from the track, and in the lower Rhone valley the trees are bent southeastward by it ; it has but a moderate extension out over the sea (Hann, *Klimatologie*, p. 436).

The Bora of the northeastern Adriatic coasts — a corruption of old " Boreas " — is of the same kind : it is a dry, cold wind from the northeasterly quarter, blowing in violent squalls from the mountains ; a flat-bottomed bank of clouds often rests on the summits during its action, and in winter, when it is strongest, it may last several days together. It is favored by the presence of an area of low pressure in the southern Adriatic, and then there may be a cold,

rude, blustering Bora on the Dalmatian coast, while Greece feels the warm, moist Sirocco; in such case, the Bora should be regarded as a cyclonic wind, modified by the highlands on its path (Lorenz and Rothe, *Lehrbuch der Klimatologie*, Vienna, 1874, 413, describe the Bora in detail, and consider it a polar current; Hann, *Klimatologie*, p. 438).

Herschel describes a wind felt at Cape Town, Southern Africa, blowing from Table Mountain (3550'); and although he regarded it as a local deflection in a general current of air, it seems rather to belong under the class of winds of local origin here brought together under the name of Bora. It "plunges down with the violence of a cataract, clinging close to the mural precipices that form a kind of background to Cape Town, which it fills with dust and uproar. A perfectly cloudless sky meanwhile prevails over the town, the sea, and the level country; but the mountain is covered with a dense white cloud, reaching to no great height above its summit and quite level, which, though evidently swept along by the wind and hurried furiously over the edge of the precipice, dissolves and completely disappears on a definite level, suggesting the idea (whence it derives its name) of a table-cloth" (*Meteorology*, 1861, 96).

Winds of this type must be found in many parts of the world, and deserve from explorers as systematic attention as is given to the search for new localities of organic species.

My pages and the days for their preparation are exhausted, but not my subject. There yet remain the effects of mountains upon atmospheric precipitation; and the clouds, rain, and snow consequently characteristic of them, as well as the more general consideration of climatic contrasts immediately upon and adjacent to mountain peaks and ranges. Of more importance still, and as yet hardly recognized, is the exploration of the phenomena of mountain meteorology in our own country, — their detection, examination, and description. Before attempting another contribution to APPALACHIA on a subject somewhat out of the line of its usual contents, it may therefore be well to wait for the collection of data that will give something more of originality, and call for fewer quotation marks than have been necessary in a first essay.

In closing, as in beginning, it is a pleasant duty to acknowledge my continued indebtedness to the writings of Dr. Hann.

## Odometer Measurements in the White Mountains.

BY FRANCIS BLAKE.

THE distances tabulated below were determined by means of an electrical odometer attached to a special Glen House coach driven from the Glen House to the Intervale House, Thursday, Sept. 30, 1886, Alfred Swanton driver.

The apparatus, as devised by the writer, consists of a circuit-closer attached to the forward wheel and axle of the coach, and connected by wires through a single cell of a Lechanché battery and an electro-magnet which works a series of five recording dials. The battery (sealed with paraffine) and dials are enclosed in a box which may be conveniently held in the lap of the observer. Each revolution of the coach wheel gives movement to the hands of the dials, so that by inspection the exact number of revolutions made by the wheel may be read and recorded.

The circuit-closing device consists of two steel "spring-fingers," secured to the axle and projecting over the hub of the wheel. These fingers are normally insulated from each other electrically; but at each revolution of the wheel a curved metal piece, attached to the hub, lifts them, and establishes a firm electrical connection during about one fifth of the revolution. This device was applied to the forward wheel and axle, because the hind wheel is frequently locked by the application of the brake.

In order that the linear values of the dial records might be exactly determined, a distance of five miles was measured with a Chesterman steel tape 100 feet in length. The measurement began in the road-bed opposite the centre of the Glen House main door, and was carried toward Jackson. Each half-mile and mile is now marked by a mile-stone painted white with inscriptions in black.

It will be noted that the first six readings in the table were made at the points which mark the five measured miles.



# 352 ODOMETER MEASUREMENTS IN THE WHITE MTS.

Their differences show that the apparatus worked perfectly, the want of exact accordance being due to the fact that the dials make no record of the fractional parts of revolutions.

The "dial-value," as deduced from the measured five miles, is 432.4 revolutions = 1 mile.

STATION.	Odometer Reading.	Difference.		Miles.	
		Between Readings.	From 1st Reading.	Glen.	Intervale.
Glen House Door	13400			0.00	19.07
One Mile Stone	18832	432	432	1.00	18.07
Two " "	14265	433	865	2.00	17.07
Three " "	14697	432	1297	3.00	16.07
Four " "	15129	432	1729	4.00	15.07
Five " "	15562	433	2162	5.00	14.07
Hayes' House	17118		3718	8.60	10.47
Rogers' "	17638		4238	9.80	9.27
Meserves' "	18264		4864	11.25	7.82
Glen Ellis "	18739		5339	12.35	6.72
Iron Mt. "	18967		5557	12.85	6.22
Bridge, Goodrich Falls	19397		5997	13.87	5.20
Glen and Conway Fork	19941		6541	15.18	3.94
Brick Yard	20437		7037	16.27	2.80
East Branch House	20748		7348	16.99	2.08
Pequawket "	21094		7694	17.79	1.28
Intervale House Door	21644		8244	19.07	0.00

## The Excursions of our first Decade.

BY GEORGE C. MANN.

Read Nov. 10, 1886.

IN presenting a list of the excursions of the Appalachian Mountain Club for the first ten years of its life, I have thought that a brief sketch of the development of the excursion idea might be interesting, especially to those of us who have been with the Club from its early days.

Field-meetings were provided for in the constitution of the Club, and one was held the first summer. I well remember that rainy morning when the first field-meeting of the Club was called to order in Mr. Worcester's pleasant study on the hillside at North Conway. The elements seemed hardly auspicious; but when, as the meeting broke up, the clouds too broke away, and showed us Mt. Washington with its broad shoulders whitened by a July snow-storm, there was something striking by which to remember the occasion. An excursion the next day upon Kiarsarge (that was its name in 1876) was truly Appalachian in spirit; for we went up, as the notice reads, "by a path not generally known." Thirty pedestrians shared in this day's climb; but when, the next day, a trip was made by cars through the Notch to the Fabyan House, one hundred and seventy-five persons participated. I am afraid it must be said that this, too, was "truly Appalachian." It was thought not wise to try to have a second field-meeting this year.

In 1877 we had three field-meetings, — at Arlington Heights, at Lexington, and at the Fabyan House. With the exception of the two first mentioned, all of our field-meetings (we have had twenty in ten years) have been gatherings of Club members and friends at some point in the White Mountains or elsewhere at a distance from Boston, for more than one day, and involving a number of days' excursions.

It may be added here that the attendance at none of these field-meetings has been less than thirty, — averaging perhaps fifty or more. An excursion to Tuckerman's Ravine in con-

nection with the North Conway field-meeting in 1879 counted one hundred ; at Newport, N. H., and at Jefferson in 1882, we had one hundred and twenty-five ; and again at the Twin Mountain House and at North Conway in 1883 we had one hundred.

In 1878 we had two genuine field-meetings, — one at the Fabyan House, with an ascent of Mt. Willey by the new path, and another at North Conway, with ascents of Moat Mountain, Carrigain, etc. This year was notable for the introduction of excursions without field-meetings, — either short half-day walks in the neighborhood of Boston, or longer trips occupying one or more whole days. Thus the May walk was instituted by a trip to Blue Hill, and it has been continued ever since. We also made our first June excursion in this year, to Wachusett.

In 1879 a second trip to the same mountain carried one hundred and twenty-five persons. There were in this year three field-meetings, including trips to Carrigain and to Tuckerman's Ravine.

In 1880 the May walk took us to the Middlesex Fells for the first time, and the June excursion to Monadnock. The field-meetings were at Plymouth, N. H., with an ascent of Moosilauke ; and at the Fabyan House, from which a party of forty ascended Mt. Washington.

In 1881 the June excursion was extended to a three days' trip, to Hoosac Mountain, Williamstown, and Greylock. The field-meeting at Jackson included a trip to Carter's Notch and Dome. In this year the first autumn excursion took place, to the Uncanoonucs, on October 22.

Beginning with two days in 1876, we had already increased to four in 1877, eight each in 1878, 1879, and 1880, and thirteen in 1881. The whole number of participants increased from about two hundred in 1876 to about five hundred in 1881. We shall find that we had in 1882 seventeen days, in 1883 twenty-six (the largest number), in 1884 twenty-two, and in 1885 twenty, the whole number of persons taking part rising in the latter year to over one thousand. The membership of the Club in 1876 was fifty, in 1885 about six hundred and fifty.

In 1882 the experiment of a winter excursion was tried ;

and the party of sixteen who went to Jackson on the 1st of February, and rode through the Notch to Fabyan's, tell us that it was successful. In this year Mt. Ascutney in Vermont was visited. The one field-meeting was at Jefferson. A September excursion carried about one hundred to Manchester, Vt., and Mt. Equinox; and late in October a large party visited Pack Monadnock.

In 1883 the May walk to the Middlesex Fells attracted more than two hundred (our largest excursion). In this year we had our first excursion out of New England. A party of fifty-five visited the Hudson River and the Catskills. The field-meeting at the Twin Mountain House this year was notable for the opening of the magnificent path over the Twin Range, for the night spent by forty-four in (or *not* in) the camp, and for the five days' trip up the East Branch of the Pemigewasset and over Mt. Field by twenty-two. The second field-meeting was at North Conway, with an ascent of Chocorua. In October a large party visited Purgatory in Sutton, and as late as November 10 another ascended Blue Hill.

In 1884 the May walk again called out a large party to Turkey Hill. Watatic was visited in June. The field-meetings were at Lake Memphremagog and at Gorham, N. H., the latter including a three days' camp on Mt. Moriah. In October a party of ninety visited Lake Winnepesaukee, one half of them going to Ossipee Park.

Last year (1885), in order, if possible, to avoid too large parties, the excursion committee began a month earlier. The result was that ninety-nine went to Rattlesnake Hill, Quincy, April 18, two hundred to Plymouth, Mass., May 9, one hundred and seventeen to Peabody, May 16, and one hundred and five to Lincoln, June 6. But, on the other hand, a delightful trip to Cardigan and Kearsarge (South), planned for June 17 and 18, had only twenty, perhaps because it came in the middle of the week. July 1, a party of one hundred went to Mt. Desert. The field-meetings were at the Flume House in July, with ascents of Kinsman and Lafayette and a camp on Liberty, and at Mt. Mansfield early in September. The season closed with a party of nearly one hundred to Moose Hill, and a smaller one to Red Hill.

There have been over one hundred and twenty distinct days spent in excursions, aggregating six thousand persons,—an average of fifty. Ninety ascents of fifty mountains and twenty hills have been made,—over fifty of them in the White Mountains. Mt. Washington has been ascended, in connection with excursions, ten times. The largest party, in 1883, consisted of forty-two persons.<sup>1</sup> The first party of more than one hundred was to Wachusett in 1879, then to Williamstown in 1881. To the Fells, in 1883, two hundred and ten went. In all there have been nine excursions of over one hundred, two of over two hundred. Five more numbered over ninety. There have been sixty excursions of thirty or more persons.

It has been objected to our Club that its chief activity and occupation lies in making excursions,—that it has failed to accomplish anything of permanent value in a geographical or scientific direction, and that it exists mainly for the amusement of its members for the time being. We know that this criticism is unjust. It must not be forgotten, however, that we are primarily an association of lovers of the mountains. It is the attraction of out-of-door life and communion with Nature that has brought us together. It is a significant fact that more than five sixths of our large membership is made up, speaking in a general way, of city residents. We combine to help each other out of the town, which man made, into the country, which God made.

TABLE I.—LIST OF EXCURSIONS AND FIELD-MEETINGS OF THE APPALACHIAN MOUNTAIN CLUB FOR THE TEN YEARS 1876-1885.

Field-meetings are in small capitals. The Roman numerals indicate their number from the beginning. The numbers in parentheses indicate the approximate number of persons participating, for the date given.

It is requested that information concerning omissions or errors in this list be sent to the Recording Secretary.

- 1876. July 26 (I.) NORTH CONWAY.
- “ 27 Mt. Kearsarge (30).
- “ 28 Mt. Willard and Fabyan House (175).
- 1877. June 2 (II.) ARLINGTON HEIGHTS.
- “ 18 (III.) LEXINGTON.

<sup>1</sup> Not including the party of one hundred in 1886.

1877. July 24 (IV.) FABYAN HOUSE.  
    " 25 Mt. Washington (30) and  
    " 26 Mt. Adams (3).  
1878. May 18 Blue Hill (30).  
    June 22 Mt. Wachusett (40).  
    July 10 (V.) FABYAN HOUSE.  
    " 11 Mt. Willey (20).  
    Aug. 21 (VI.) NORTH CONWAY (25).  
    " 22 Moat Mountain (35).  
    " 23 Fabyan House.  
    " " Mt. Carrigain (19).  
    " " Mt. Willard.  
    " " Mt. Washington.  
1879. May 17 Prospect Hill (Waltham) (35).  
    June 21 Mt. Wachusett (125).  
    July 9 (VII.) CRAWFORD HOUSE.  
    " 10 Mt. Carrigain (30).  
    " 11 Livermore to Waterville (11).  
    Aug. 20 (VIII.) WATERVILLE, N. H.  
    " 27 (IX.) NORTH CONWAY.  
    " 28 Tuckerman's Ravine (100).  
1880. May 22 Cascade (Melrose) and Spot Pond (46).  
    June 19 Mt. Monadnock (70).  
    July 20 (X.) PLYMOUTH, N. H.  
    " 21 Mt. Prospect (25).  
    " 22 Mt. Moosilauke (50).  
    Sept. 2 (XI.) FABYAN HOUSE.  
    " 3 Mt. Willard.  
    " 3-4 Mt. Washington (40) and  
    " 4 Tuckerman's Ravine (20).  
1881. May 21 Doublet Hill (Weston) (18).  
    June 17 Williamstown (110) and  
    " " Hoosac Mountain (90).  
    " 18 Bald Mountain (70) and Greylock (35).  
    " 20 Berlin Mountain (30).  
    July 19 (XII.) JACKSON.  
    " " Thorn Mountain (75).  
    " 20 Carter Notch to Glen House (40),  
    " " Carter Dome (12),  
    " 21 Mt. Washington (by Great Gulf) (8), and  
    " " Tuckerman's Ravine (4).

1881. Sept. 6 (XIII.) BETHLEHEM.  
 " 7 Franconia Notch (30) and  
 " " Mt. Lafayette (6).  
 " 8 Mt. Washington (8).  
 " " Mt. Prospect (Lancaster) (20).  
 " 9 Percy Peaks (12):  
 Oct. 22 Uncanoonucs (50).  
 1882. Feb. 1 Jackson (16).  
 " 2 Fabyan House.  
 " 3 Thorn Mountain (2).  
 May 27 Breakheart Hill (Saugus) (110).  
 June 16 Newport, N. H., and  
 " " Lake Sunapee (125).  
 " 17 Mt. Ascutney (60).  
 " 19 Dartmouth College (35).  
 July 18 (XIV.) JEFFERSON (125).  
 " 17 Mt. Washington (7).  
 " 18 Mt. Starr King (40).  
 " 20 Mt. Adams (24),  
 " " Mt. Madison (20),  
 " " King's Ravine (36), and  
 " 21 Mt. Washington (2).  
 " " Franconia Notch (5).  
 " " Owl's Head (50) and  
 " " Cherry Mountain (3).  
 Sept. 28 Manchester, Vt. (98).  
 " 29 Mt. Equinox.  
 " 30 Lake George (30).  
 Oct. 21 Pack Monadnock Mountain (93).  
 1883. May 19 Middlesex Fells (210).  
 June 23 Greenfield, N. H. (50), and  
 " " Lyndeboro' Mountain (9).  
 " 29 Hudson River and Catskill Mountains (55).  
 July 2 Haines's Falls,  
 " " Kaaterskill Falls, and  
 " " High Peak (16).  
 " 3 Overlook Mountain House (10).  
 " " Clove (6).  
 " " Kaaterskill Falls, etc.  
 " 21 (XV.) TWIN MOUNTAIN HOUSE (100).  
 " " Cherry Mountain (35) and

1883. July 21 Owl's Head (16).  
 " 23 Twin Mountain Range (40) and  
 " 23-27 East Branch of the Pemigewasset and  
 " 28 Mt. Field (22).  
 " — Mt. Washington (42).  
 " — Franconia Notch (50).  
 " — Mt. Willard (50).  
 Sept. 4 (XVI.) NORTH CONWAY (100).  
 " " Hurricane Mountain (25).  
 " " Middle Mountain (20).  
 " 5 Willey Notch.  
 " " Mt. Willard (35).  
 " " Mt. Washington.  
 " " Mt. Crawford (27) and  
 " " Giant's Stairs (2).  
 " 6 Mt. Chocorua (28).  
 Oct. 6 Purgatory (Sutton) (75).  
 Nov. 10 Blue Hill (55).  
 1884. May 17 Turkey Hill (Arlington) (125).  
 June 17 Mt. Watatic (50).  
 July 9 (XVII.) NEWPORT, VT. (41).  
 " " Lake Memphremagog (41).  
 " 10 Jay Peak (23).  
 " 11 Owl's Head (14).  
 " 12 Lake Willoughby (34).  
 " " Mt. Annanance (25).  
 " " Bald Hill (9).  
 Sept. 12 (XVIII.) GORHAM, N. H.  
 " " Berlin Falls and Heights (32).  
 " 13 Bald Cap (11).  
 " " Glen Ellis Falls and Crystal Cascade (22).  
 " " Randolph Hill.  
 " " Mt. Hayes.  
 " 15 Mt. Surprise (25).  
 " 15-17 Mt. Moriah (14).  
 " 16 Imp Mountain and  
 " " Mt. Carter.  
 " 17 Middle Moriah and Shelburne Moriah.  
 " " Mt. Surprise.  
 Oct. 11 Lake Winnepesaukee (90).  
 " " Mt. Gunstock (15).



## 360 THE EXCURSIONS OF OUR FIRST DECADE.

1884. Oct. 11-13 Ossipee Park and Mountain (40).  
 " 25 Moose Hill (Sharon) (30).  
 1885. April 18 Rattlesnake Hill (Quincy) (99).  
 May 9 Plymouth, Mass. (200), and  
 " " Manomet Hill (150).  
 " 16 Ship Rock and Bartholomew's Pond (Peabody) (117).  
 June 6 Lincoln (105).  
 " 17 Mt. Cardigan (20).  
 " 18 Mt. Kearsarge (Warner) (15).  
 July 1 Bar Harbor (Mt. Desert) (100).  
 " 2 Green Mountain (75).  
 " 3 Newport Mountain, etc. (40).  
 " 21 (XIX.) FLUME HOUSE (63).  
 " 22 Mt. Kinsman (6).  
 " " Cannon Mountain (20).  
 " " Owl's Head.  
 " 23 Mt. Lafayette (50),  
 " " Mt. Lincoln (20),  
 " 24 Mt. Liberty (20), and  
 " " Flume Mountain (6).  
 Sept. 1 (XX.) MT. MANSFIELD (40).  
 " 2 Over "Chin" into Smuggler's Notch (8).  
 " 3 Smuggler's Notch (25).  
 " 4-5 Ausable Chasm (38).  
 " 19 Moose Hill (Sharon) (95).  
 Oct. 10 Red Hill (40).

### TABLE II. — LIST OF FIELD MEETINGS, 1876-1885.

1876. I. North Conway (1).  
 1877. II. Arlington Heights.  
 III. Lexington.  
 IV. Fabyan House (1).  
 1878. V. Fabyan House (2).  
 VI. North Conway (2).  
 1879. VII. Crawford House.  
 VIII. Waterville, N. H.  
 IX. North Conway (3).  
 1880. X. Plymouth, N. H.  
 XI. Fabyan House (3).  
 1881. XII. Jackson.  
 XIII. Bethlehem.

1882. XIV. Jefferson.  
 1883. XV. Twin Mountain House.  
 XVI. North Conway (4).  
 1884. XVII. Newport, Vt.  
 XVIII. Gorham, N. H.  
 1885. XIX. Flume House.  
 XX. Mt. Mansfield.

TABLE III. — LIST OF THE PRINCIPAL MOUNTAINS AND HILLS  
 ASCENDED BY THE EXCURSION PARTIES.

Mt. Chocorua.	Mt. Bond.
Moat Mountain.	Mt. Lafayette.
Mt. Kearsarge (North).	Mt. Lincoln.
Hurricane Mountain.	Mt. Liberty.
Middle Mountain.	Mt. Flume.
Thorn Mountain.	Cannon Mountain.
Carter Dome.	Mt. Kinsman.
Mt. Carter.	Mt. Moosilauke.
Mt. Hayes.	
Mt. Surprise.	Jay Peak.
Mt. Moriah.	Owl's Head.
Imp Mountain.	Mt. Annanance.
Bald Cap.	Bald Hill.
Percy Peaks.	Mt. Mansfield.
Mt. Prospect (Lancaster).	Mt. Equinox.
Mt. Starr King.	Mt. Ascutney.
Owl's Head.	Mt. Cardigan.
Cherry Mountain.	Mt. Kearsarge (South).
Mt. Adams.	Red Hill.
Mt. Madison.	Mt. Prospect (Holderness).
Mt. Jefferson.	Mt. Gunstock (Belknap).
Mt. Clay.	Ossipee Mountain.
Mt. Washington.	Mt. Monadnock.
Mt. Monroe.	Pack Monadnock.
Mt. Pleasant.	Uncanoonus.
Mt. Clinton.	Lyndeboro' Mountain.
Giant's Stairs.	
Mt. Crawford.	Hoosac Mountain.
Mt. Field.	Greylock.
Mt. Willard.	Berlin Mountain.
Mt. Willey.	Mt. Watatic.
Mt. Carrigain.	Mt. Wachusett.
Twin Mountains.	
Mt. Guyot.	Catskills.

Green Mountain, }  
Newport Mountain, } Mt. Desert.

Doublet Hill.  
Prospect Hill.  
Arlington Heights.  
Turkey Hill.  
Middlesex Fells.  
Breakheart Hill.

Manomet Hill.  
Rattlesnake Hill.  
Blue Hill.  
Moose Hill.

## Tenth Anniversary of the Appalachian Mountain Club.

THE tenth anniversary of the Club was celebrated by a dinner at the Parker House, Boston, on Friday, March 5, 1886. The dinner was announced by the following circular:—

### Appalachian Mountain Club,

9 PARK STREET, ROOM 17.

BOSTON, MASS., Feb. 20, 1886.

The Appalachian Mountain Club will celebrate its Decennial Anniversary by a Dinner, to be given at the Parker House, in Boston, on Friday, March 5, 1886, at 6.30 P. M. (Ladies' Entrance, School Street.)

Tickets, admitting one person, can be obtained by members of the Club on payment of \$2.50 at the bookstore of Messrs. W. B. Clarke & Carruth, No. 340 Washington Street, Boston, on and after February 22, and until March 3. Members wishing additional tickets, for friends, at \$3.00, can obtain them, after March 3, by leaving their names with Messrs. Clarke & Carruth, who will furnish them, in the order of their application, until the supply is exhausted.

SAMUEL H. SCUDDER,  
THOMAS WENTWORTH HIGGINSON,  
ISAAC Y. CHUBBUCK,  
*Committee of Arrangements.*

Members and guests, to the number of about one hundred and twenty-five, met at the Parker House at the appointed time. The *menu* of the entertainment was as follows:—

## MENU.

## BLUEPOINTS, DEEP SHELL.

"And I have sinuous shells of pearly hue." — *Landor*.

## SOUP

## MOCK TURTLE.

## JULIENNE.

"Nothing is so good as turtle soup, except mock turtle." — *Lowell*.

## FISH.

## FILET DE SOLE, À L'ITALIENNE.

## SMELTS, À LA TARTARE.

"Why seek Italy,  
Who cannot circumnavigate the sea  
Of thoughts and things at home?" — *Emerson*.

## REMOVES.

## SADDLE KENTUCKY MUTTON.

"Revenons à nos moutons." — *Pierre Patelin*.

## TENDERLOIN BEEF WITH MUSHROOMS.

"Whose pastime  
Is to make midnight mushrooms." — *The Tempest*.

## PHILADELPHIA CAPON, PURÉE SPINACH.

"With good capon lined." — *As You Like It*.

## ENTRÉES.

## VOL AU VENT OYSTERS.

## MACARONI, AU GRATIN.

## CHICKEN CROQUETTES, À LA BECHAMEL.

## VENISON PATTIES.

## BANANA FRITTERS.

"Any pretty little tiny kickahaws, tell William Cook." — *Henry IV*.

## ROMAN PUNCH.

"When they are at Rome, they do there as they see done." — *Burton*.

## GAME.

## RED HEAD DUCK.

## BLACK DUCK.

## BLUEBILL WIDGEON.

"Hast thou named all the birds?" — *Emerson*.

## SWEETS.

## CHARLOTTE RUSSE.

## GRAPE MERINGUES.

## WINE JELLY.

## BISCUIT GLACÉ.

"Sweets to the sweet; farewell!" — *Hamlet*.

## ORANGES.

## BANANAS.

## APPLES.

## GRAPES.

## DRY FRUIT.

"Autumn fruit that mellowed long." — *Shenstone*.

## ICE CREAM.

## SHERBET.

"O'er many a frozen, many a fiery Alp." — *Milton*.

## COFFEE.

"Coffee which makes the politician wise." — *Pope*.

The erudite annotations upon this *menu* are understood to have been contributed by a member of the Committee of Arrangements who had been expected to preside at the dinner, but was kept at home by ill-health. The actual presiding

officer was Professor E. C. Pickering, of the Harvard Observatory, the first president of the Club. A condensed report of the after-dinner exercises follows:—

#### OPENING ADDRESS OF PROF. E. C. PICKERING.

I have been wondering why the Committee of Arrangements came to me to occupy this position. I told them that an astronomer was not in the habit of taking his dinner in this way. He is accustomed, when he is at work about dusk and is ready for an evening meal, to rush in from the observatory with his watch in his hand, and say, "Now I have got just twelve minutes before another star will come into sight that I must observe. Is dinner ready?" As that excuse did not satisfy the Committee, I told them that I was unfamiliar with the duties of such an occasion as this. But they comforted me very much by saying that there were no duties connected with this position; that what I should have to do as presiding officer was just to ask you, one after the other, to make a few remarks, and all the duties would devolve on you, and all I had to do was to listen to what you would say.

But, in all seriousness, the work of the Appalachian Club and its progress during the last ten years has been a matter of great interest to me. When we look back and see how small was the beginning, I think we may be proud of our record in all respects. If we consider the relations of the mountains to man during the last years, I think we shall see that these relations have undergone a change. The last generation, perhaps, were those who gave to the mountains their position as a source of human enjoyment and interest. Before that time the mountains were looked upon almost as something to be disliked. To find enjoyment in them by making constant visits to them has been a comparatively modern discovery, a modern invention; and I think we may justly ascribe to the last few years of the present generation the use of the mountains as a means of advancing human knowledge. This country has borne a very important portion of that work; and, directly and indirectly, our Club has also done its portion.

It is hardly necessary for me to go into detail with regard to the history and other matters connected with the Club, because that can be done better by others. I will therefore proceed at once to call upon the President of the Club, who is himself the best illustration we could have of the importance that is given in the

Appalachian Mountain Club to scientific work. Allow me to introduce Mr. Edmands.

MR. J. RAYNER EDMANDS (of the Harvard College Observatory, President of the Club). — *Ladies and Gentlemen*: It is a great pleasure for me to respond on this occasion. It seems hardly necessary to remind any of you of the appropriateness of our being welcomed by the presiding officer of the evening; for it was Professor Pickering who sent the first postal card to perhaps a hundred of those who would be interested, he thought, in forming such a Club. The outcome of that invitation you all know.

Now, for the first time, we are able to add up the years of the Club and carry one. The tenth year has passed and the eleventh has opened. What is at the bottom of it all? Why is it that we felt sure there was a call for the existence of such a Club? In the beginning our attempt spoke for our faith in what could be done by co-operation, united effort of those interested in a common object; but it would have been very hard to state just what that object was to be. Now that ten years have gone, it seems to me we might be able to give some more general statement of what our object is.

It seems to me that the fundamental cause of our pronounced success lies in the fact of the great benefit to us, and to all in the more thickly settled parts of the country, in getting a certain amount of out-door life among the less thickly settled parts. It is the hilly country which seems to us the best field for our enjoyment and profit, and so the advantage which can be got from out-door life in a hilly country would seem to me to be the reason for our existence.

The work of our Club is to a certain extent play-work, yet to a certain extent serious. We mean to increase the means and facilities for this sort of enjoyment and profit, and we aim to do that not only for ourselves but for all who go into the same regions or similar regions. That is one striking feature of our Club.

Then, coming to a more practical side of it, there is another unique feature. We are not bound down by the considerations of market values. If we have an excursion to arrange, we do not have to ask whether we shall get the profit which a business concern would wish to get if it were to spend its time in such work. If we are to publish a map, we do not have to ask that it shall have a sale the profits of which shall pay for the plates. If we are to publish a magazine, we do not have to ask that it shall be self-

supporting. Thus we are enabled to undertake a great many things that we could not undertake if we were controlled by questions of profit. We do not mean that we are entirely regardless of such things. If we could look into the debates of the Council and hear the various subjects discussed which occupy its time, we should find a great deal of it is spent in considering how to keep up and enlarge the revenues of the Club, and how to keep down the expenses. Why do we try to have a margin in this way? Simply that we may take hold of some new thing which, when it is first started, may prove expensive. Although it might be impossible to look ahead and say what new step our Club will next take, it would seem that this process is likely to go on, inventing as we can new ways of work, giving attention to the practical considerations involved, and then securing a surplus for something else. That has been the history of a great deal of the Club's work.

MR. PICKERING. — There are two occasions in which I feel that I have occupied a place which would have been better filled by one other member of this Club. One of these occasions is the present, when the Committee of Arrangements, instead of asking their own chairman to preside here, asked me to do so; and the other was when the same gentleman was, ten years ago, elected vice-president instead of president of the Club. Reference has been made to the desirability of having some account of the work of the Club, and I do not know where we could go to find a man who better represents the scientific work of the Club than by calling on Mr. Scudder.

MR. S. H. SCUDDER (of Cambridge). — *Mr. President*: I am not unwilling to say a word, for I am very proud of this Club. I think it has a distinct and beneficial work to do. I say this as a professional zoölogist. We have a great deal of closet work to do, and it is a good thing to come into direct contact with Nature in the fields and woods; and it is this that this Club does. I believe that from the ranks of this Club will come those who shall extend science, and I am therefore deeply interested in its success.

I wish now, Mr. President, to read a couple of letters from two of our members, — one an Honorary Member, the other a Corresponding Member. I will reserve other letters till a later hour.

(Letters from Mr. Whittier and from Mr. Clarence King were read by Mr. Scudder. See pp. 373, 374.)

MR. PICKERING. — It used to be claimed, and I think with entire truth, that many of the engineers while engaged in work in the

survey of the Territories, did more hard climbing with their barometers, while engaged in scientific work, than many accomplish in travelling for pleasure in the Alps. I am sorry we have not Mr. King with us here to-night, but we are fortunate in having with us one who was associated with him, who has himself been a great climber and explorer, and who, I believe, in the way of ascending mountains at the West, has done more climbing vertically than many of us have done horizontally; and I hope Professor Brewer will give us some words this evening.

PROFESSOR BREWER (of the Yale Scientific School). — *Ladies and Gentlemen*: I have been a sort of corresponding member of this Club, if you mean by corresponding member one corresponded with but not corresponding, for some years, and I am specially gratified to meet with you at this time, when there is so much to remind me of mountaineering.

Previous to 1860 there was no high-mountain climbing done in the United States, and, so far as I know, no attempt to measure any of our high mountains, except one, by any of the many expeditions sent out by the Government. That exception was the measurement of Union Peak, as it was first called, by Colonel Frémont in 1843 or 1844. Pike's Peak was at first called James Peak, for a botanist, who was the first one to ascend it. The military officers took off that name and placed on it the name of Pike in later times. With the beginning of the geological survey of California in 1860, there was a beginning of a systematic survey and measurement of the mountains of the United States. The nearest that we came to it before was the work done by Professor Guyot in the Adirondack chain. Professor J. D. Whitney, as director in chief of the California work, felt that it was very important to make topographical maps of that State. I went out as his assistant, going in 1860; and then was inaugurated that system of measurement which has since been extended to so many mountain chains in the country,—and not only that, but the system of mapping was then changed. Before then all the maps that had been made, had been made by a system of "meandering." A party going along would "meander" their trail, and it would be put on paper afterward. All of the maps made previous to 1862 of that region, if plotted on the same scale, would not fit well enough for us to tell what valleys were meant. The system was an exceedingly deficient one.

In the spring of 1861 Professor Whitney employed a German, C. F. Hoffman, to assist in the geological work as topographer, for



we had to have topographical maps for our geological work. Mr. Hoffman then began that system of mountain triangulation which has been since brought to such very wide use in the East and in the West, — not that fine triangulation proposed by the Coast Survey, in which they would make their triangles through a wide region meet within a few inches, but a rough triangulation by which we could get a general, rapid map of the country, a triangulation carried on from peak to peak, and which would give us the positions of all the peaks within a quarter or an eighth of a mile, and the general course of the rivers. 1860, 1861, and 1862 we spent in exploring the coast ranges. In September, 1862, we made the ascent of Shasta, then supposed to be the highest point in America. Frémont, who was the most intrepid climber among the officers of the United States, had attempted it three times and failed. It is easy enough to climb a mountain when you know where to go up; but when you have a mountain 14,402 feet high to climb, you cannot spend a great many trips on false ascents. It is long and hard work. He tried it from the sides most difficult of access, and failed. He had to explore his way. We went up from the west side, and we were by no means the first on top. And, by the way, there is an illustration in that peak of the difficulties one frequently has. I collected all the information I could for two years regarding it. Many told us that it could not be ascended; others told us that it was perfectly easy; one man said that grass grew nearly to the top, yet the fact that its snows are seen at the distance of one hundred and fifty miles made me doubt his word. But when we got up we found no great difficulties, no crevasses, no fearful precipices, only an exceedingly hard climb. The slope we took for eight thousand or more feet was at an angle of twenty-five or thirty degrees, and an hour's climbing did not make much headway; but when we got to the top we found people had been there before us. There was a liberal distribution of "California conglomerate," a mixture of tin cans and broken bottles, a newspaper, a Methodist hymn-book, a pack of cards, an empty bottle, and various other evidences of a bygone civilization.

The next year I crossed the chain of the Sierra Nevada, in connection with this work, at fourteen different points; and the first map of any portion of the United States, of any considerable elevation, made from triangulation of any kind, — I mean of any high mountain region, — was the map published by the Geological Survey of California of the region about the Yosemite valley. The work was done partly in 1863-1864 and 1865. It was drawn in 1866 by

Mr. Hoffman, and finished by Mr. J. T. Gardiner. The region about the Yosemite valley is now visited by a great many, but it is to be regretted that more do not go back of that region. It is a region of marvellous beauty. I do not wonder that some people would rather go to Switzerland than to California. Before I had seen California I had taken a foot-trip in Switzerland and Tyrol of some eleven or twelve hundred miles. I footed it, but it is the Paradise of travel. There are good hotels, good roads, the picturesque effects of cultivated lands, vineyards, villages, and all the historic associations. In our Western country there is undoubtedly more grandeur and sublimity, but the places are farther apart. The whole of Switzerland embraces about fifteen or sixteen thousand square miles, — I mean political Switzerland. From Lassen's Peak, if you take the peaks in view, Mt. Shasta, Mt. Pitt, then on to the Star Peak, and to the mountains to the south, and draw a line around the peaks that bound the horizon, it will enclose an area of more than sixty thousand square miles, possibly more than seventy thousand square miles. On the south at sunrise we could see points two hundred miles distant in an air line. And when you recollect that the United States Coast Survey has used one of its primary triangles on that coast giving a sight vision of one hundred and seventy miles, — the longest views on record, from observations between Shasta and Mt. St. Helena, — you will appreciate these immense distances. You have there clear air and cloudless skies, but these great distances diminish the ease of getting about. It is more of a job to get from San Francisco to Shasta than from London to St. Petersburg. It is more trouble to get through the Mt. Whitney region than to go through half a dozen Switzerlands.

MR. PICKERING. — We had hoped to have with us one of our associate members, who is at present in the city, and who has made some astronomical observations at great heights, on the summits of Whitney and Etna. He cannot be with us, but we have a guest of the Club this evening who has also done some admirable work at a considerable elevation, which could not have been done at any lower station, and which I think it would have been almost impossible to obtain elsewhere, — Professor Young.

PROFESSOR C. A. YOUNG (of Princeton College). — *Mr. Chairman*: Let me begin by expressing my astonishment. When I was invited here by the Secretary of the Committee of Arrangements, I thought I might perhaps meet fifteen or twenty gentlemen

who would talk over scientific matters. I had no idea that I was to meet such a body of members. I had no notion that the Appalachian Club had grown to such an extent. I had no idea that the occasion was of this stamp. I am one of those unfortunate individuals—I know you will all despise me—who think that mountains are better to look at than to climb. Years ago, before my diameter was what it is at present, I used to enjoy climbing. I remember very vividly Mt. Washington, when we went up Jacob's Ladder on horseback, when the horse appeared to be going up a fire-escape, and you held on by the ears. There was some enjoyment then, but since those days I like best those mountains that you can get at by railroad, or those that you can enjoy by sitting at one end of a telescope, and watch the changing landscape and all the beautiful things come out, one after another,—the mountains of the moon. That, indeed, is very lovely. And so it is to watch the sunrise on one of our White Mountains. But the mountains for me, and I think for all astronomers, are those that we can get at with the railroads, where we can go with our telescopes and not encounter the difficulties that have been mentioned.

MR. PICKERING.—It is a point of great importance,—how far mountains are to be used in astronomical work in the future. You know that there is being constructed now the largest telescope in the world, which is to go to an altitude of four or five thousand feet. The greatest gift that has ever been made to this department is the bequest of Uriah Boyden, who devised his entire estate, something like a quarter of a million, to establish an observatory on some lofty summit. When this fund becomes available we may expect a great addition to our knowledge not only of mountains, but of astronomy. Now let us pass to another science. We should, in order of ideas, have put astronomy last and geology first. In considering also the condition of the Appalachian Club, it would have been proper to have had something said in regard to its beginning. On both these subjects I am sure that Professor Niles is admirably qualified to address you.

PROFESSOR NILES (of the Institute of Technology).—*Mr. Chairman, Ladies and Gentlemen:* I am very happy to be here with those who rejoice in the prosperity which gathers around the first ten years of the Club. I look back with pleasure to the fact that I was one of the first members, one of those who gathered at the preliminary meeting. We went to that meeting with an inward

yearning for something, but we did not quite know what, and went to have Professor Pickering tell us. After it was decided that a mountain club might be formed in our own territory the question of a name came up. That was the great question at issue. "White Mountain Club" was suggested. But then it was thought that some day, perhaps, we might like to go to the Green Mountains of Vermont, or even to Katahdin in Maine, "New England Mountain Club" was then suggested. But it was feared that some day some daring person might want to go to the Adirondacks or into Canada. Then we said we must take some name that shall include all the mountains along the eastern borders of the continent, and the name "Appalachian" was proposed. And here I remember some of the remarks that were made at the suggestion of this name: "How do you spell it, two ps or one?" Besides the doubt as to the orthography, it was discovered that there were four different ways of pronouncing the word. What should we call it? If we could spell, write, and pronounce it, what did it mean? One individual said, when the name was proposed, "If that is not enough to kill the Club I do not know what will kill it." That was only ten years ago, and we are here to-night rejoicing in the popularity of the Appalachian Mountain Club. And I venture to say that there are hundreds and thousands of people that know far more of the Appalachian mountain system than they would have known if this Club had not been formed. We selected a good name for it. I think that we all rejoice that we did not select one of narrower geographical limits, but one to which we have given a broader significance among the masses of the people.

MR. PICKERING. — The work and responsibility resting on the Council of the Club become greater and greater. We have had many persons who have taken an active interest both in the Club and in the Council; but no one has done more for both than Professor Fay, and I hope we may hear from him to-night.

PROFESSOR C. E. FAY (of Tufts College). — *Mr. President:* I thought you were going to say "to-morrow morning," and lest it should prove to-morrow morning I shall make my remarks brief. I believe it is customary, at our decennial dinners, to revert considerably to our early days. Several of our speakers have made serious reference to what the Club has accomplished. I have noted one or two little points, less serious, that have possibly escaped general observation. You remember that we were organized in the

physical lecture-room of the Institute of Technology. I have noticed the strong influence that the Club has had upon the Institute. We all recognize its kindness in housing us for so many years, but I do not think we have sufficiently considered how much we have done in return. Did you notice that just after it got thoroughly acquainted with us and our ways and purposes, and they were in need of a president, they immediately called a *Walker*? And what an immense success he has proved! I think we did a good thing for the Institute, and certainly for ourselves, when we conferred upon this noble Walker the title of Corresponding Member of the Appalachian Club.

There is another way, outside of New England, in which our usefulness, even our perfectness, has been recognized. I confess I have been moved with pride at the recognition of the excellence of our magazine. I think you all may have noted the fact, within a few months, that very broadly over our country has appeared a new sign, "A. M. C. Perfect Cereals!" Now, Ladies and Gentlemen, the only *serial* that has ever existed in our country, to my certain knowledge, published by the "A. M. C.," is our own APPALACHIA. So it appears that our influence has been widely extended.

But, merriment aside, as for the amount of pleasure and profit that has been got out of our Club, it would take more than till to-morrow to tell. The delights that I have experienced in these excursions, the joys that have been mine as I have gazed from our mountain peaks, even the pleasure in looking from our neighboring hills — as only a day or two ago from Bear Hill, where I looked on our New Hampshire mountains clad in snow and ice, and then wandered through the woods with no companions save the rabbits that trotted ahead in the path, — all these delights have come through the Appalachian Club; and if there is any one man profoundly grateful to you and to the Club for all that it has been to him, it is myself.

There is much that I ought to say for the Council, but I will only remark that its great delight is always to work for a body of such appreciative members as the seven hundred, more or less, that form the Appalachian Mountain Club.

MR. PICKERING. — It is not unusual for the Club to do some travelling in New Hampshire. Looking into the papers for the past few days, we have seen accounts of snow-banks so deep that only the smoke-stacks of locomotives appeared above them. We have with us to-night one of our members from New Hampshire,

and we should be very glad to hear from Mr. Eastman the facts about the locomotives.

MR. E. C. EASTMAN (of Concord, N. H.). — *Ladies and Gentlemen*: Most of you have heard of President Pierce, and possibly of old Father Brodhead, a celebrated minister in New Hampshire, who had the good fortune to be elected to Congress at the same time Mr. Pierce was. He was a man of a great deal of force and character. One day he met Mr. Pierce near the Capitol, and the old father took him along, and as they walked he said, "Mr. Pierce, I want to say something to you. You are going to resign your place in this House and are going back to New Hampshire; then you are going to be sent to the other end of the Capitol. After that you will go to the other end of the Avenue, and after that you will become a preacher of the Gospel." An old friend of mine met Mr. Pierce before he died, and asked him if the last part of the prophecy were going to come true. The old gentleman replied, "Too late, too late." It is nearly midnight, and I do not think I will trouble you with any speech. It is "too late."

Adjourned by MR. PICKERING.

## LETTERS.

OAK KNOLL, DANVERS, 2nd mo. 23, 1886.

S. H. SCUDDER, THOMAS WENTWORTH HIGGINSON, ISAAC Y. CHUBBUCK, *Com.*

I fear it will not be possible for me to be present at the celebration of the Decennial Anniversary of the Appalachian Club. But I am not willing to let the occasion pass without expressing the lively interest which I feel in the Club, and the satisfaction with which I read its published proceedings. It has opened up new vistas and perspectives, blazed paths for future pilgrims to newly discovered shrines of Nature, and cheered the hearts of home-bound invalids with the records of its visits to picturesque mountain regions. As to myself, my days of actual mountaineering are over, but the Club has enabled me to do a good deal by way of proxy. In spirit I have been with its explorers, like the unseen passenger of Uhland's boatman, and have shared their pleasure without their fatigue. Of late years I have only made annual visits to the Sandwich and Ossipee Mountains, content with surveying them from the distance which is said to lend enchantment; and, even in so doing, have realized something of "the strength of the hills."

With every possible good wish for the continued prosperity of the Appalachian Club, I am

Faithfully your friend,

JOHN G. WHITTIER.

18 WALL ST., NEW YORK.

TO MESSRS. SAMUEL H. SCUDDER, THOMAS WENTWORTH HIGGINSON, ISAAC Y. CHUBBUCK, *Committee Appalachian Mountain Club.*

DEAR SIRS, — I beg to acknowledge your kind invitation to dine with the Appalachian Mountain Club on March 5th, and to express my sincere regret that a previous engagement prevents me from accepting.

The bond of kindred experience which all the world over binds men together, is felt nowhere more strongly than on the cold summits of mountains. To have shared an isolation is like having braved a common danger in its power of engendering sympathy. To have breathed the upper air with the barometer at 16 inches is to become a brother of all mountaineers. And thus, though I know less of the Appalachians than the others about your table, I should have felt at one with you, and joined you gladly in overcoming the ice, even if it were flavored with vanilla.

Regretfully yours,

CLARENCE KING.

CAMBRIDGE, MASS., 22 février, 1886.

A MESSIEURS S. H. SCUDDER, T. W. HIGGINSON, I. Y. CHUBBUCK, *Comité des Arrangements.*

MES CHERS CONFRÈRES, — Je vous remercie de votre bien aimable invitation au Dîner décennal de l'Appalachian Mountain Club. Je regrette d'autant plus que ma mauvaise santé ne me permet plus depuis plusieurs années d'accepter aucune invitation, que j'apprécie hautement l'honneur que vous me faites de me joindre à vous dans une occasion aussi solennel.

Agréez, Messieurs, avec mes regrets, mes sincères remerciements.

Votre dévoué,

JULES MARCOU.

Letters of regret were also received from ex-Presidents Worcester and Scott; and from Professors Edward Tuckerman (Amherst), James D. Dana (New Haven, Conn.), James Hall (Albany, N. Y.); Dr. George M. Dawson (Ottawa, Ont.); Professors James T. Gardiner (Albany, N. Y.), J. E. Hilgard (Washington, D. C.), S. P. Langley (Alleghany, Pa.), E. S. Morse (Salem); General M. C. Meigs, Captain G. M. Wheeler, Messrs. S. F. Emmons and Henry Gannett (all of Washington, D. C.); President D. C. Gilman, of Johns Hopkins University (Baltimore, Md.); Miss Lucy Larcom (Beverly); Rev. George A. Strong (New Bedford); Messrs. E. J. Houston (Philadelphia) and J. J. Stevenson (New York), and Mr. and Mrs. James Schouler (Boston).

## Proceedings of the Club.

March 10, 1886. Seventy-third Corporate Meeting.

President Edmands in the chair.

Eighty persons were present. Lieutenant A. W. Greeley was elected a Corresponding Member. The candidates for corporate membership presented at the last meeting, eight in number, were elected, and fourteen nominations were presented.

The Corresponding Secretary reported that two hundred and fifty francs had been sent to the French Alpine Club in aid of the monument to De Saussure. He also stated that Mr. E. C. Eastman had presented to the library the Report of the State Geological Survey of New Hampshire, with Atlas.

Mr. S. H. Scudder, for the Committee on Decennial Celebration, read several letters from Honorary and Corresponding Members, expressing regrets that they could not be present.

Mr. J. Rayner Edmands read a paper entitled "A Day on Flume Mountain and a Night in the Wilderness." He described the Flume and the view from Flume Mountain, and explained how, on leaving the summit in the fog, he took the wrong ridge and descended to the Franconia Branch. Professor C. E. Fay described his trip on the same day over Lafayette, Lincoln, and Liberty; also the night search which was made for Mr. Edmands.

Mr. S. H. Scudder made some remarks on the progress of the State Topographical Survey, and suggested the expediency of the Club's publishing the Boston and Greylock sheets in advance of the publication of the whole State map. The subject was referred to the Council.

Mr. Rosewell B. Lawrence exhibited a proof of a new map of the Middlesex Falls, intended to show wood-roads and foot-paths.

Mr. Edmands, in a short paper, presented the following subject for discussion: "What should be done by or for persons detained (possibly lost or injured) among woods and mountains?" The discussion proved very interesting, but many more questions were asked than were answered.

March 23, 1886 (Evening). — Special Meeting.

President Edmands in the chair.

One hundred persons were present.

Mr. S. H. Scudder occupied the evening with an account<sup>1</sup> of his three months' adventures by stage, canoe, and ox-cart with an eclipse party in

<sup>1</sup> Since published under the title "The Winnipeg Country," by A. Rochester Fellow. Boston: Cupples & Upham, 1886.



the Winnipeg and Saskatchewan country a quarter of a century ago. The paper contained much information concerning the natural features and other characteristics of the country, and also described the Indians and early settlers.

April 14, 1886. Seventy-fourth Corporate Meeting.

President Edmands in the chair.

About sixty persons were present. The records of the last meeting were read and approved. The candidates for membership presented at the last meeting, fourteen in number, were elected, and twenty nominations for corporate membership were presented. Baron A. E. Norden-skiold, Dr. F. V. Hayden, Major J. W. Powell, and Professors Archibald Geikie, George Davidson, and S. P. Langley were nominated as Honorary Members.

The following amendment to the By-laws was passed unanimously:—

Amend Art. XIV. by adding: Appropriations to the Permanent Fund shall be ratified by the Club at a regular meeting, notice of the proposed action having been sent to all the members. There shall also be a Reserve Fund, to and from which appropriations may be made by a majority vote (not less than five) at two meetings of the Council, notice of the proposed action having been given upon the call for the second meeting.

The Corresponding Secretary reported the receipt from the French Alpine Club of a letter recognizing the gift in aid of the De Saussure monument.

Announcements were made concerning the spring excursions and outings.

Professor E. C. Pickering presented for discussion plans for a Summer School of Geodesy and Topography. He mentioned the advantages of a summer school, enlarged upon the departments of work which might be undertaken, and suggested Mts. Moosilauke and Mansfield as desirable locations. He expressed the hope that the Institute of Technology, Harvard College and Observatory, and the United States Coast and Geological Surveys would co-operate in the undertaking. Remarks in favor of establishing such a school were made by Professor A. E. Burton, Councillor of Topography, Willard D. Johnson of the United States Geological Survey, President Eliot of Harvard College, Professor W. H. Niles, and others. On motion of Mr. S. H. Scudder, the subject was referred to the Council for their favorable consideration.

A paper by Dr. A. S. Packard, entitled "Over the Mexican Plateau in a Diligence," was read by Mr. F. W. Freeborn. The paper contained a description of the scenery, people, and natural history of the country, together with an account of the writer's experiences.

April 20, 1886 (Evening). — Special Meeting.

President Edmands in the chair.

The meeting was chiefly of a social character. About one hundred and seventy members and friends were present.

During the evening Rev. John Worcester showed fifty lantern-views of scenery on the Great Range. The photographs were taken by his sons last summer, while camping on the mountains with friends. The series included many fine views of the several mountain peaks and some beautiful cloud effects.

May 12, 1886. — Seventy-fifth Corporate Meeting.

President Edmands in the chair.

Eighty-five persons were present. The records of the two meetings in April were read and approved. The six candidates for Honorary, and twenty for corporate membership, nominated at the regular meeting in April, were elected. Sergeant David T. Brainard, of Washington, D. C.; Hon. J. P. Bradley, of Washington, D. C.; Captain Clarence E. Dutton, of Washington, D. C.; Dr. Alphonse Favre, of Switzerland; Dr. Albert Heim, of Zurich, Switzerland; Professor Edward S. Holden, of Mt. Hamilton, Cal.; William H. Holmes, Esq., of Washington, D. C.; Sir Joseph Dalton Hooker, of Kew, England; Major Jed. Hotchkiss, of Staunton, Va.; Dr. J. Scott Keltie, of London, England; Dr. R. von Lendenfeld, of Christ Church, New Zealand; Señor Antonio Raimondi, of Peru; Ferdinand, Freiherr von Richthofen, of Berlin, Germany; and Professor Arthur Schuster, of Manchester, England, were nominated for Corresponding Membership; and thirty-five candidates for corporate membership were presented.

A new form of voting, recommended by the Council, was discussed and then referred back to the Council for further consideration.

Final action was taken upon the following amendment to the By-laws, and the amendment was passed unanimously: —

Amend Art. XIV. by adding: Appropriations to the Permanent Fund shall be ratified by the Club at a regular meeting, notice of the proposed action having been sent to all the members. There shall also be a Reserve Fund, to and from which appropriations may be made by a majority vote (not less than five) at two meetings of the Council, notice of the proposed action having been given upon the call for the second meeting.

Colonel T. W. Higginson, in behalf of the Committee on Room, announced that the Wednesday evening opening would be discontinued.

Mr. J. Ritchie, Jr., made an announcement concerning the June excursion to Virginia.

Mr. S. H. Scudder gave an account of a recent trip on snow-shoes

through Carter Notch and into Tuckerman's Ravine, illustrating the same with photographs which he presented to the Club.

Miss F. O. Dabney gave an account of "An Ascent of the Peak of Teneriffe." She described the Canary Islands, and Teneriffe in particular, and traced upon a map the line of ascent to the summit of the mountain, 12,200 feet above the sea. Incidents of the trip were given, with a description of the crater and the magnificent view.

Mr. Winfield S. Nevins read a short paper on "The Slide in Tuckerman's Ravine in August, 1885." He estimated the length as 1,200 feet, and the width as 50 to 100 feet.

A beautiful painting of Chocorua by Miss S. M. Barstow, intended for the Club-room, was presented in her behalf, with a brief explanation of the picture, by the Recording Secretary. A large framed photograph of the Wetterhorn and Welhorn, and a photograph of a sketch of the Profile Notch were presented by Miss H. Louisa Brown, the latter being her own work. The thanks of the Club were voted to the two ladies for their gifts.

#### June 9, 1886. — Seventy-sixth Corporate Meeting.

President Edmands in the chair.

Thirty-two persons were present. Fourteen candidates for Corresponding, and thirty-five for corporate membership, nominated at the last meeting, were elected. Eight nominations for corporate membership were presented.

The Recording Secretary moved that the action of the Council in appropriating \$248.38 to the Permanent Fund be ratified. Remarks in favor of the motion were made by Messrs. Lawrence, Mann, Jones, Scott, Niles, and others; and remarks in opposition by Messrs. E. C. Pickering, W. H. Pickering, Lanza, Burton, Edmands, and others. The motion was passed by a vote of sixteen to nine.

Professor A. E. Burton, Councillor of Topography, made a statement concerning the summer work of his department, and the advance sheets of the White Mountain map.

Photographs of scenery in Virginia and West Virginia, loaned by Mr. E. B. Pratt, were exhibited. One of the Natural Bridge was presented by him to the Club.

#### July 1-8, 1886. — Twenty-first Field Meeting.

Held at the Summit House, Mt. Washington, N. H.

On Friday evening, July 2, a meeting was held in the hotel parlor, with President Edmands in the chair; about one hundred persons were present. Professor N. S. Shaler gave a valuable paper on "The Formation of Mountains," explaining a new theory which he is endeavoring to establish, — namely, that mountains may be the result of a lateral movement of material.

. Saturday evening, Professor W. S. Farlow gave an interesting talk on the flowers gathered during the day.

Tuesday evening, July 6, Professor Farlow read a paper on "Mountain Floras." He said the White Mountain region was the best in the Eastern United States for the study of alpine plants, and there are two seasons at which the flowers are most abundant, — the first soon after the snow has melted, at the end of June and the beginning of July; and the second towards the end of August and the beginning of September. He made comparisons between the floras of the White Mountains, Greenland, and the Alps.

A meeting of those attending the first excursion made by the Club to the Adirondacks was held at the Winsor House, Elizabethtown, N. Y., on Friday evening, September 3.

Mr. Verplanck Colvin, Superintendent of the Adirondack Survey, welcomed the party to the region, and read an interesting paper, in which he described certain geological features of the high-mountain section of the great Adirondack district. He called especial attention to the interesting observation that the summits of Mt. Marcy and the adjacent peaks are wholly free from foreign drift, while Mt. Whiteface and the mountains in its neighborhood bear marks of ice-action to their tops. In explanation of this he suggested that the drift-covered mountains had suffered elevation since the drift period, while the Marcy group had not.

October 13, 1886. — Seventy-seventh Corporate Meeting.

President Edmands in the chair.

Sixty persons were present. The candidates for corporate membership presented at the last regular meeting, eight in number, were elected, and eighteen nominations were presented.

The President exhibited a map of Williamstown and Greylock, Mass., executed by the United States Geological Survey, and published by the Appalachian Mountain Club.

The Corresponding Secretary reported acceptances of election to Honorary and Corresponding Membership, and read a letter from Lieutenant A. W. Greely. He also reported the receipt of seven volumes of the publications of the French Alpine Club through its librarian, M. E. A. Martel, who is also a member of the Appalachian Mountain Club.

A paper on the "General Geology of the Adirondacks," by Mr. Verplanck Colvin, announced to be read at this meeting, was postponed, with the expectation that he might be able to present it in person later in the season. Professor C. E. Fay then made some remarks upon the Adirondacks, and gave an account of the Club excursion to that region.

Mr. Rosewell B. Lawrence read a paper entitled "Ascents of the Camel's Rump, and some of the Rangeley Lake Mountains." The paper

described a trip via Phillips to Rangeley Lake, and thence up the Cupsuptic River, and across to Lake Parmachenee. Besides the Camel's Rump, Bosebuck, Deer, Bald, and Blue Mountains were ascended (see p. 294).

November 10. — Seventy-eighth Corporate Meeting.

President Edmands in the chair.

Thirty-three persons were present. The records of the last meeting were read and approved. The candidates for membership presented at the last meeting, eighteen in number, were elected. Nineteen nominations were presented.

The President announced the republication of APPALACHIA, Vol. I. No. 1.

The subject of constitutional amendments was then taken up, beginning with No. 4 upon the list issued with the call for the meeting.

This amendment was passed after omitting the word "a" before "member," and adding the following clause: "and thereupon the interest of such person in the Corporation and its property shall cease."

No. 4. Insert after Art. XIII. a new article as follows:—

"Art. XIV. The name of any member of the Club may, on recommendation of the Council, and by vote of two thirds of the members present and voting at a regular meeting of the Club, be dropped from the roll of members, provided that due notice has been sent to such member, and formal announcement of such recommendation has been made at a preceding meeting of the Club; and thereupon the interest of such person in the Corporation and its property shall cease."

Amendments numbered 5, 6, and 7, were passed without change.

No. 5. Amend by making the first sentence of Art. XIV., concerning life membership, Art. XV.

No. 6. Amend by making the second and third sentences of Art. XIV., Art. XVI., by changing the words "so received," and omitting the words "by the Treasurer," so that the new article shall read:—

"Art. XVI. All moneys received for life membership and such other sums as may be received or appropriated for permanent investment shall be securely and separately invested as a Permanent Fund, the income only of which shall be expended. Appropriations to the Permanent Fund shall be ratified by the Club at a regular meeting, notice of the proposed action having been sent to all the members."

No. 7. Amend by making the fourth sentence of Art. XIV., Art. XVII.:—

"Art. XVII. There shall also be a Reserve Fund, to and from which appropriations may be made by a majority vote (not less than five) at two meetings of the Council, notice of the proposed action having been given upon the call for the second meeting."

No. 8 was passed after adding to the third sentence the words "and exhibit the vouchers."

No. 8. Amend by inserting a new article as follows:—

"Art. XVIII. The Permanent and Reserve Funds shall be under the direction and control of a Board of Trustees, consisting of three members of the Club, one being chosen annually to serve three years and until his successor is chosen. The Treasurer shall not be eligible. At each annual meeting and at such other times as the Council may request, the Trustees shall make a written statement of the condition of the funds in their hands, and exhibit the vouchers."

[At the annual meeting in 1887 three members of this board shall be chosen to serve, respectively, one, two, and three years.]

Nos. 9, 10, and 3 were passed without change.

No. 9. Amend by changing Art. XV. to Art. XIX.

No. 10. Amend by changing Art. XVI. to Art. XX.

No. 3. Amend Art. VIII. by inserting after the words, "all funds belonging to the Club," the following: "excepting such as are in the hands of the trustees."

No. 1 was passed after inserting the words "within three months" after the word "Council," omitting the word "succeeding," and adding at the end the words "next succeeding the approval."

No. 1. Amend Art. III. so that the second and third sentences shall read:—

"Nominations shall be made in writing by at least two members, and forwarded to the Recording Secretary. They shall be announced at a regular meeting, and, if approved by the Council within three months, balloting shall take place at the regular meeting next succeeding the approval."

A motion was then made that when the names of candidates are to be announced to the Club, the list of names shall be sent to all members with the call for the meeting. The motion was lost by a tie vote. A motion to reconsider was not seconded.

Amendment No. 2, increasing the admission fee from three to five dollars, was lost by a vote of fifteen in favor to six opposed, the requisite three-fourths not being obtained.

A paper on "Excursions of our first Decade" was read by Mr. George C. Mann. (See p. 353.)

December 8. — Seventy-ninth Corporate Meeting.

President Edmands in the chair.

Twenty-six persons were present. The records of the last meeting were read and approved. The Corresponding Secretary reported upon the exchanges recently received by the Club library. The candidates for

membership presented at the last meeting, nineteen in number, were elected. Fifteen nominations for corporate membership were presented, and Verplanck Colvin, of Albany, N. Y., was nominated for Corresponding Membership.

The amendments to the By-laws, passed at the last meeting, came up for final action, and were unanimously passed a second time, action being taken *seriatim*. The only change was a slight one in Art. XVIII., so that the last clause reads:—

“ At each annual meeting the Trustees shall make a written statement of the condition of the funds in their hands, and at such times as the Council may request, shall exhibit the vouchers.”

Remarks were made by Professor C. E. Fay, concerning the recent failure to pass the amendment raising the admission fee from three to five dollars; and upon motion of Mr. R. F. Curtis, it was voted that the amendment be placed upon the call for the next meeting.

Upon motion of Professor Fay, it was voted that standing committees of a given Council shall retain their offices till their successors are appointed, or till they are otherwise relieved by the new Council.

On motion of the Recording Secretary, it was voted that the President appoint a committee of three to nominate officers and trustees for the year 1887. It was also voted that the President appoint an auditing committee of three, and a committee of three on annual reception, the latter committee to have power to add to its numbers. The following appointments were subsequently made: Committee on Nominations, Col. T. W. Higginson, Mr. W. H. Pickering, and Mrs. M. E. MacKaye; Auditing Committee, Mr. C. W. Kennard, Mr. S. E. D. Currier, and Mr. A. S. Lynde.

The proposed amendment to the By-laws, making the President and Vice-President eligible for three consecutive years instead of a single year, was taken up. After some discussion, an amendment was offered that the wording of the original amendment be so changed as to remove all limit as to time. On account of the small number present at the meeting, it was voted to lay upon the table both the original amendment and its amendment.

The report of the Councillor of Natural History was read. It stated that five stations in the White Mountain region had been supplied with rain-gauges, and maximum and minimum thermometers, — Berlin Mills, Quincy, Shelburne, Stratford, and West Milan, — and that records are received from these monthly.

The Councillor of Topography presented his report, mentioning his own work in the vicinity of Gorham, N. H., and the maps published this year by the Club, viz.: Middlesex Fells, Williamstown and Greylock, and the blue prints of the White Mountain map.

The report of the Councillor of Art was read, in which a list was given

of paintings, photographs, and other works of art presented to the Club during the year.

The Councillor of Improvements presented an extended report, giving a history of the Club's activity in the first decade in this department, and describing the work of the present year.

December 16, 1886 (Evening). — Special Meeting.

The Recording Secretary called the meeting to order. Eighty-six persons were present, in spite of a severe storm.

A paper entitled "A Trip to Norway and the North Cape" was presented by Miss Marion Talbot; the wonderful scenery and interesting people were described, and also the view of the midnight sun from the North Cape. To illustrate this paper, fine views of Norwegian scenery, prepared from photographs belonging to Mr. Charles Larned, were thrown upon the screen.

Rev. John Worcester showed about forty lantern views of White Mountain scenery; these included views taken upon the Mt. Washington carriage-road, in the Alpine Garden, and in Huntington's and Tuckerman's Ravines, and a few winter scenes in North Conway.

There were placed upon tables for exhibition Mr. Larned's collection of Norwegian photographs, and a few of Cuba and Jamaica, together with White Mountain photographs, presented to the Club by Mr. and Mrs. T. E. M. White.

## Members added since March 1, 1886.

### HONORARY MEMBERS.

Davidson, Prof. George, San Francisco, Cal.	Langley, Prof. S. P., Allegheny, Penn.
Geikie, Prof. Archibald, London, Eng.	Nordenskiöld, Baron A. E., Stockholm, Sweden.
Hayden, Dr. F. V., Philadelphia, Penn.	Powell, Major J. W., Washington, D. C.

### CORRESPONDING MEMBERS.

Bradley, Hon. Joseph P., Washington, D. C.	Greely, Lieut. A. W., Washington, D. C.
Brainerd, Serg. D. L., Washington, D. C.	Heim, Prof. Albert, Zurich, Switzerland.
Dutton, Capt. C. E., Washington, D. C.	Holden, Prof. Edward S., San José, Cal.



Holmes, Wm. H., Esq., Washington, D. C.

Hooker, Sir Joseph Dalton, Sunningdale, Berkshire, Eng.

Schuster, Prof. Arthur, Manchester, Eng.

#### CORPORATE MEMBERS.

(The names of Life Members are printed in small capitals.)

Alden, Mrs. John E., Newton.

Allen, Mrs. Frederick E., New Bedford.

Babson, Thomas M., Boston.

Baker, Miss C. A., Cambridge.

Barnes, Miss Ella L., New York City.

Barry, Mrs. Esther E., Newtonville.

Batchelder, Miss Isabel, Cambridge.

Brackett, Albert C., Newton.

Bradford, Miss Edith, Cambridge.

Bradford, Russell, Cambridge.

Brewster, Miss Harriet, Boston.

Brown, Miss Ella F., Charlestown.

Budd, H. A., New York City.

Casey, John F., Boston.

Chesley, Egbert M., Boston.

Clapp, Dwight M., Boston.

Clapp, Mrs. D. M., Boston.

Clarke, Miss Medora F., Malden.

Coburn, Miss Annie C., Weston.

Coleman, Miss Emma L., Boston.

Corne, Miss F. E., Cambridge.

Crosby, Miss Lydia L. W., Boston.

Cummings, Miss Mary F., Boston.

Currier, Charles H., Roxbury.

Currier, Mrs. Charles H., Roxbury.

Curtis, Thomas R., Boston.

Darling, Herbert L., Boston.

DAVIS, Miss AGNES A., Brookline.

Davis, Mrs. Elizabeth S., Brookline.

Edwards, Rev. Jonathan, Wellesley Hills.

Eliot, Miss Emily B., Roxbury.

Emond, Wm. H., Dorchester.

Faulkner, Miss E. F., Watertown.

Fisher, Miss Florence H., Attleboro.

Fowler, Miss Clara M., Boston.

Freeman, Miss Eliza A., Boston.

Fuller, Mrs. Sarah S., Boston.

Gates, A. W., Boston.

Gleason, Miss Hannah G., Boston.

Gooding, Fred M., Waltham.

Greenwood, Miss Helen M., Boston.

Hart, Albert Bushnell, Cambridge.

Haskell, Augustus S., West Roxbury.

Herbert, John, Somerville.

Horne, Edwin T., Dorchester.

Howe, Mrs. Kate Brewster, Boston.

Hunting, Alfred A., Salem.

Hunting, Mrs. Alfred A., Salem.

Hunting, Miss Anna H., Boston.

Hurd, Melancthon M., Intervale, N. H.

Hutchings, James H., Boston.

Josselyn, Edgar A., Roxbury.

King, Miss Helen L., Quincy.

King, Theophilus, Quincy.

Kinsman, Miss B. D., Boston.

Lane, Miss Susan M., Cambridge.

Lincoln, D. F., Savannah, Ga.

Lord, Augustus M., Cambridge.

Loring, Miss Z. W., Duxbury.

Mansfield, Miss Emily C., Boston.

May, Miss Adelina, Lynn.

McGiffert, William D., Boston.

Merrill, Miss Elizabeth F., Quincy.

Meteyard, Mrs. M. G., Cambridge.

Millett, Miss Mary E., Charlestown.

Mitchell, Edward W., Medford.

Mitchell, Miss Matilda, Boston.

Moore, Alexander, Jr., Boston.

- Morse, Miss Mary E., Dorchester.  
Neal, Miss Maria, Cambridge.  
Noyes, Charles J., South Boston.  
Noyes, Miss Fannie C., South Boston.  
Nye, Miss Abbie F., Charlestown.  
Odiorne, Mrs. C. T., Jamaica Plain.  
Paine, Miss Isabella, Boston.  
Parris, Edward Lowden, New York City.  
PEEK, WILLIAM H., Chicago, Ill.  
Peloubet, Rev. F. N., Natick.  
Pollock, Miss Laura M., Roxbury.  
Pope, Miss C. Augusta, Boston.  
Pope, Miss Emily F., Boston.  
Porter, Miss Helen, Medford.  
Pritchard, Myron T., Roxbury.  
Ramsay, Mrs. Charles H., Boston.  
Reed, Edwin, Cambridge.  
Riddle, Charles W., Boston.  
Roberts, Joseph A., Auburndale.  
Robinson, Walter A., Franklin Falls, N. H.  
Safford, T. H., Williamstown.  
Sampson, Miss Florence W., Newton.  
Saville, Mrs. Henry M., Cambridge.  
Saville, Sumner C., Cambridge.  
Sawyer, Miss Hattie P., Boston.  
Schlesinger, B., Boston.  
Schouler, Miss Margaret C., Boston.  
Sears, Horace S., Weston.  
Shepherd, James, Boston.  
Silsbee, Miss Elizabeth W., Salem.  
Smith, B. Frank, Jr., New York City.  
Smith, Miss Zilpha D., East Boston.  
Stetson, Miss A. M., Bangor, Maine.  
Stevens, Wm. Stanford, Boston.  
Strong, George, Newton.  
Talbot, Miss S. H., Boston.  
Tenney, Miss Alice L., Boston.  
Tenney, Benjamin, Boston.  
Thorndike, Henry A., Auburndale.  
Viles, Mrs. Delia L., Boston.  
Ward, Andrew Henshaw, Allston.  
Ward, Julius H., Roxbury.  
Watts, Miss Mary J., Brookline.  
Wellman, Miss Mary F., Brookline.  
Wentworth, Miss Mary E., Boston.  
Wilde, Joseph D., Melrose.  
Wilde, Mrs. Joseph D., Melrose.  
Williston, Miss Alice M., Cambridge.  
Woodruff, Thomas T., Boston.  
WOODS, MRS. SARAH A., South Boston.  
Woodworth, Artemas B., Lowell.  
Young, James H., Boston.



# INDEX.

---

## A.

- AAR, movement of the Hôtel des Neuchâtelois on the Glacier of, 91.  
 Accurate mountain heights, 215.  
 Adirondacks, general geology of, 379.  
 Alaska, lecture on, 168; summer trip to, 169.  
 Alpine Club of Williamstown, 45, 92.  
 Alpine clubs, 88, 156, 171, 173, 246, 273, 278, 375, 376. *See also* exchanges.  
 Alpine congress, at Villach, 173, 246; at Turin, 246.  
 Altitudes in Massachusetts, 132, 171.  
 Amendments to By-Laws, 88, 91, 155, 376, 377, 380, 382.  
 Androscoggin, region south of, 261.  
 Appalachia, republication of Vol. I. No. 1, 380.  
 Appalachian Mountain Club, tenth anniversary of, 362.  
 Arizona, 172.  
 Arts, reports of councillor of, 69, 382.  
 Associació d'excursions Catalana, anuari de la, 61.

## B.

- BAILEY, W. W. Recollections of West Humboldt Mountains, 151.  
 BAKER, Miss E. J. Presents photographs, 92, 275.  
 Bald Cap, ascent of, 93.  
 Bald Hill, ascent of, 93.  
 BARSTOW, Miss S. M. Presents painting of Chocorua, 378.  
 Bartholomew's Pond, excursion to, 280.  
 BEHM, E. Resolutions on death of, 87.  
 Ben Nevis, ascent of, 172.  
 Berlin Falls, excursion to, 93.  
 Bibliography, 58.  
 BICKNELL, T. W. Summer trip to Alaska, 169.  
 Black Mountain, N. C., trip to, 88.  
 BLAKE, F. Odometer measurements in White Mountains, 351.  
 Blue Ridge, 75.  
 Borden Survey, 132, 171.  
 Bowlder Brook Falls, 273.  
 BREWER, W. H. Decennial celebration of A. M. C., 367.

- BROWN, Miss H. L. Presents photographs, 378.  
 BUCKLEY, J. M. Walk from Waterville through Thornton Gore, 273.  
 BURTON, A. E. Report of councillor of topography, 163, 256, 275, 382; elected councillor of topography, 170, 277.  
 BUTLER, A. A. Mt. Huntington, 40; Trip pyramid slides of 1885, 177, 276.  
 By-Laws, amendments to, 88, 91, 155, 376, 377, 380, 382.

## C.

- Camel's Rump, 294, 379.  
 Carter-Moriah Path, 269, 278.  
 Carter-Moriah Range, excursion to, 94.  
 CHAMBERLAIN, E. G. Altitudes in Massachusetts, 132, 171.  
 CHAPIN, F. H. Ascent of the Zinal Rothorn, 97, 174.  
 CHICKERING, J. W. Bowlder Brook Falls, 273.  
 Chocorua, 275, 322.  
 CHUBBUCK, I. Y. Report of councillor of improvements, 168, 267, 383; elected councillor of improvements, 170, 277.  
 CLARKE, W. B. Presents photographs, 173.  
 Club Alpin Français, Annuaire du, 60.  
 Club-room, 170, 245.  
 Colorado, 170.  
 COLVIN, V. General geology of the Adirondacks, 379.  
 COMMITTEES APPOINTED: to nominate officers, 92, 276, 382; auditing, 92, 276, 382; for annual reception, 169, 382.  
 COMMITTEE REPORTS: on excursions, 89, 91, 274, 376, 377; on nomination of officers, 170, 277; on decennial celebration, 375; on club-room, 377.  
 Connecticut River, from the sources of, to Rangeley Lakes, 105, 172.  
 COOK, E. B. Mts. Blue and Cushman, 34; record of a day's walk, 54; report of councillor of exploration, 70, 92, 164, 256, 275; Speckled Mountain, 71; new paths in Randolph, 86; elected councillor of exploration, 170; Round Mountain, 257, 276; excursion over Mts. Nancy, Anderson, and Lowell, 262.

- COOK, Miss E. W. Poem at field meeting, 90.  
 Correspondence. *See* Exchanges.  
 Corresponding members, 170, 376, 377, 378, 382; list of, 175, 383.  
 Corresponding secretary, report for 1884, 156; for 1885, 246.  
 Councillor's Reports. *See* the different departments: Natural History, Topography, Art, Exploration, Improvements.  
 Crescent Mountain, 73.  
 Crystal Cascade, excursion to, 94.  
 CURTIS, Miss M. F. Presents photographs, 173.
- D.**
- DABNEY, Miss F. O. Ascent of the Peak of Teneriffe, 378.  
 DAVIDSON, G. First ascent of the volcano Makushin, 1; Borden Survey and work in California, 171.  
 DAVIS, W. M. Book notice, 58; geographic evolution, 172; earthquakes in New England, 190; mountain meteorology, 225, 276, 327; elected councillor of natural history, 277; report of councillor of natural history, 382.  
 Decennial celebration of A. M. C., 362.  
 De Saussure, subscription to monument for, 278, 375, 376.  
 Donations, 70, 88, 92, 158, 160, 169, 173, 174, 247, 250, 275, 376, 378, 383.
- E.**
- Earthquakes in New England, 190.  
 EASTMAN, E. C. Decennial celebration of A. M. C., 373; presents Report of State geological survey of N. H., 375.  
 EDMANDS, J. R. Hydrography of north-eastern Vermont, 88; topography of the Lake Memphremagog region, 89; accuracy and exaggeration in reproduction of mountain landscapes, 90; report of councillor of topography, 92; elected vice-president, 170; day on Flume Mountain and night in wilderness, 194, 274, 375; elected president, 277; decennial celebration of A. M. C., 365; assistance to persons detained among woods and mountains, 375.  
 Exchanges and correspondence, 88, 157, 171, 173, 246, 273, 278, 376, 379, 381.  
 EXCURSIONS, to Turkey Hill, 87, 92; of the season of 1884, 92; to Mt. Watatic, 93; on Lake Memphremagog, 93; to Jay Peak, 93; to Owl's Head, 93; to Lake Willoughby, 93; to Mt. Annanance, 93; to Bald Hill, 93; to Berlin Falls and Heights, 93; to Bald Cap, 93; to Glen Ellis Falls and Crystal Cascade, 94; to Randolph Hill, 94; to Mt. Hayes, 94; to Carter-Moriah Range, 94; to Lake Winnepesaukee, 94; to Mt. Gunstock, 94; to Ossipee Park, 94; to Moose Hill, 95; to Tuckerman's Ravine in winter, 124, 173; of the season of 1885, 280; to Rattlesnake Hill, 280; to Manomet Hill, 280; to Bartholomew's Pond, 280; to Lincoln, 280; to Mts. Cardigan and Kearsarge, 280; to Mt. Desert, 281; to Mt. Lafayette, 281; to Mt. Mansfield, 281; to Moose Hill, 282; to Red Hill, 282.  
 Excursions of our first decade, 353, 381.  
 Exploration, reports of councillor of, 70, 92, 164, 256, 275.
- F.**
- FARLOW, W. G. Mountain floras, 379.  
 FAY, C. E. Book notices, 59, 61, 62; trip to northeastern Vermont, 88; report of corresponding secretary, 156, 246; elected corresponding secretary, 170, 277; Was Chocorua the original Pigwacket Hill? 275, 322; decennial celebration of A. M. C., 371; trip over Lafayette, Lincoln, and Liberty, 375. *See also* Exchanges.  
 FIELD MEETINGS, at Newport, Vt., 89, 93; at Gorham, N. H., 90, 93; at Flume House, 273, 281; at Mt. Mansfield, 274, 281; at Summit House, Mt. Washington, 378.  
 Flora, of Willoughby Notch, 64; of Mt. Monadnock, 145.  
 Floras, mountain, 379.  
 Flume Mountain, 194, 274, 375.  
 Formation of mountains, 378.  
 FRISBIE, J. F. Trip over Ossipee Mountain, 91.
- G.**
- GANNETT, H. Dictionary of altitudes in U. S., 62; presents maps, 174.  
 GARDINER, F., Jr. Trip in Arizona, 172.  
 Geographic Evolution, 172.  
 Georgianna Falls, path to, 84.  
 Glen Ellis Falls, excursion to, 94.  
 GOODRICH, A. L. Region east of Wild River and south of Androscoggin, 261.  
 Greylock, map of Williamstown and, 379.
- H.**
- HAMLIN, C. E. Report of councillor of natural history, 64; Ktaadn, 81.  
 Heights, in the U. S., 62; in Mass., 132, 171; accurate mountain, 215; of White Mountains, 305.  
 HIGGINSON, T. W. Elected president, 170; club-room, 170.  
 Honorary members, 376, 377; list of, 383.  
 HOTCHKISS, J. Topography and geology of Mt. Rogers, Va., 278.  
 HUBBARD, L. L. Delegate to Alpine congress at Villach, 173, 246; delegate to International congress at Turin, 246.  
 Humboldt Mountains, 151.  
 Humphrey's Ledge and its view, 180.  
 HURD, M. M. Ascent of the Matterhorn, 278, 285.
- I.**
- Ice Gulch, 78, 90.  
 Improvements, report of councillor of, 82, 92, 166, 267, 383.

J.

- Jay Peak, excursion to, 93.  
 Jefferson, slide at, 254, 274.  
 JONES, G. M. Elected treasurer, 170, 277;  
 report of treasurer, 251.

K.

- Katabdin. *See* Mt. Ktaadn.  
 KENNARD, C. W. Report of treasurer, 161.  
 Kilauea, visit to, 174.  
 KING, C. Letter from, 374.  
 KNEELAND, S. Visit to crater of Kilauea,  
 Sandwich Islands, 174.  
 KNOX, M. V. B. Slide at Jefferson, N. H.,  
 254, 274.

L.

- Lake Memphremagog, topography of the  
 region around, 89; excursion on, 93.  
 Lake Winnepesaukee, excursion to, 94.  
 LANE, Mrs. E. A. Presents lantern slides,  
 169.  
 LANGLEY, S. P. Spectre of the Broken,  
 89; relics of primeval forest on Mt.  
 Whitney, 89.  
 LANZA, G. Ascent of Mt. Garfield, 265,  
 274.  
 LAWRENCE, R. B. From the sources of the  
 Connecticut to the Rangeley Lakes, 105,  
 172; report of recording secretary, 154,  
 244; elected recording secretary, 170,  
 277; Middlesex Fells, 174, 199, 375;  
 Camel's Rump and the Rangeley Lake  
 Mountains, 294, 379.  
 Library of the Club, 158, 247, 277. *See*  
*also* Donations.  
 Lincoln, excursion to, 280.

M.

- MACKEY, Mrs. M. E. Book notice, 60.  
 Madison Spring, camp life at, 91.  
 Makushin, first ascent of, 1.  
 MANN, G. C. Elected councillor of natural  
 history, 170; report of councillor of nat-  
 ural history, 254, 275; elected vice-presi-  
 dent, 277; excursions of our first decade,  
 353, 381.  
 Manomet Hill, excursion to, 280.  
 MARCOU, J. Letter from, 374.  
 Massachusetts, altitudes in, 132, 171; trig-  
 onometrical survey, 132, 171.  
 Matterhorn, a photographic study of, 87;  
 ascent of, 278, 285.  
 May Walk, 87, 92, 280.  
 MEMBERS, list of, 95, 175, 283, 384;  
 HONORARY, 376, 377; list of, 383; COR-  
 RESPONDING, 170, 375, 377, 378, 382;  
 list of, 175, 383.  
 Meteorology, mountain, 225, 275, 327.  
 Meurer's Illustrierter Führer durch die  
 Ortler-Alpen, 62.  
 Mexican Plateau, over the, in a diligence,  
 876.  
 Middlesex Fells, 174, 199, 375.  
 Mitchell Mountain, a visit to, 12.

- Moose Hill, excursion to, 95, 282.  
 Mt. Anderson, 262.  
 Mt. Annanance, ascent of, 93.  
 Mt. Blue, 34.  
 Mt. Cardigan, excursion to, 280.  
 Mt. Chocorua, 275, 322.  
 Mt. Crescent, 73, 78, 90.  
 Mt. Cushman, 34.  
 Mt. Desert, excursion to, 281.  
 Mt. Huntington, 40, 90.  
 Mt. Garfield, ascent of, 265, 274.  
 Mt. Gunstock, excursion to, 94.  
 Mt. Kearsarge, excursion to, 280.  
 Mt. Ktaadn, an autumn visit to, 90; notes  
 on, 81.  
 Mt. Lafayette, ascent of, 281, 375.  
 Mt. Lowell, 262.  
 Mt. Mansfield, geodetic observations from,  
 276; excursion to, 281.  
 Mt. Monadnock, flora of, 145.  
 Mt. Moosilauke, geodetic observations  
 from, 276.  
 Mt. Nancy, 262.  
 Mt. Rogers, 278.  
 Mt. Royce, 261.  
 Mt. Surprise, ascent of, 94.  
 Mt. Watatic, excursion to, 93.  
 Mt. Watnomsee, 75, 90.  
 Mountain floras, 379.  
 Mountain heights, accurate, 215.  
 Mountain landscapes, accuracy and exag-  
 geration in reproduction of, 90.  
 Mountain meteorology, 225, 275, 327.

N.

- Natural history, report of councillor of,  
 64, 254, 275, 382.  
 NEVINS, W. S. Slide in Tuckerman's  
 Ravine in August, 1885, 378.  
 New Mexico, 170.  
 NICHOLS, H. P. A week in the Pemige-  
 wasset wilderness, 171.  
 NILES, W. H. Elected councillor of nat-  
 ural history, 170; decennial celebration  
 of A. M. C., 370.  
 Norway and the North Cape, trip to, 383.  
 NOWELL, W. G. Camp life at Madison  
 Spring, 91; the Carter-Moriah path,  
 269, 278.

O.

- Odometer measurements in the White  
 Mountains, 361.  
 OFFICERS for 1885, 170, 175; for 1886,  
 277, 283.  
 Ossipee Mountain, a tramp over, 91.  
 Ossipee Park, excursion to, 94.  
 Owl's Head, list of plants found on, 68;  
 excursion to, 93.

P.

- PACKARD, A. S. Ascent of Popocatepetl,  
 277; over the Mexican Plateau in a  
 diligence, 376.  
 PARKER, W. B. Report of councillor of  
 improvements, 82, 92; elected council-  
 lor of exploration, 277.

- Paths, 82, 166, 267; to Georgianna Falls, 84; in Randolph, 86, 268; Carter-Moriah, 269, 278.
- PEEK, W. H. The Ice Gulch, 78, 90; exploration of Pilot Range, 219, 278.
- Pemigewasset wilderness, a week in, 171.
- Pennsylvanian Maps, 58.
- Permanent Fund, 378.
- PICKERING, E. C. A photographic study of the Matterhorn, 87; effect of mountains on rainfall, 89; accurate mountain heights, 215; geodetic observations from Moosilauke and Mansfield, 276; heights of the White Mountains, 305; address at decennial celebration, 364; summer school of geodesy and topography, 376.
- PICKERING, W. H. Ascent of Vesuvius on the Pompeian side, 170; elected councillor of art, 170.
- Piedmont, collections for relief of sufferers in, 171, 246, 273.
- Pigwacket Hill, was Chocorus the original? 275, 322.
- Pilot Range, exploration of, 219, 278.
- Plymouth County, some of the hills of, 171.
- Popocatepetl, ascent of, 277.
- PRATT, E. B. Proposed trip to the Virginias, 174; presents photographs, 378.
- PROCEEDINGS of the Club, 87, 168, 273, 375.
- PYCHOWSKA, Mrs. L. D. Crescent Mountain, 73, 90.

## R.

- Rainfall, effect of mountains on, 89.
- Randolph, new paths in, 86, 268.
- Rangeley Lake Mountains, 294, 379.
- Rattlesnake Hill, excursion to, 280.
- Record of a day's walk, 54.
- Red Hill, excursion to, 282.
- Report of corresponding secretary for 1884, 156; for 1885, 246.
- Reports of councillors. *See* the different departments: Art, Exploration, Improvements, Natural History, Topography.
- Report of recording secretary for 1884, 154; for 1885, 244.
- Report of treasurer for 1884, 161; for 1885, 251.
- Resolutions, 87.
- RIDLER, C. F. Flora of Willoughby Notch, 64; list of plants found on Owl's Head, 93; some of the hills of Plymouth County, 171.
- RITCHIE, J., Jr. Appalachian region in Virginia, 173.
- Roan Mountain, visit to, 12; notes of a recent trip to, 88.
- Rothhorn, ascent of the Zinal, 97, 174.
- Round Mountain, 257, 276.

## S.

- SANDERSON, C. W. Elected councillor of art, 277; report of councillor of art, 382.
- Schwatka, F. Lecture on Alaska, 168.
- SCOTT, A. E. A visit to Mitchell and Roan Mountains, 12; Black and Roan Mountains, 88; Scottish Highlands and ascent of Ben Nevis, 172.

- Scottish Highlands, 172.
- SCUDDER, S. H. Alpine Club of Williamstown, Mass., 46, 92; movement of Hôtel des Neuchâtelois on Glacier of the Aar, 91; winter excursion to Tuckerman's Ravine, 124, 173, 377; presents photographs, 173, 378; decennial celebration of A. M. C., 366; Winnipeg country, 375.
- SHALER, N. S. Formation of mountains, 378.
- Secretary, corresponding, report of, for 1884, 156; for 1885, 246.
- Secretary, recording, report of, for 1884, 154; for 1885, 244.
- Slide at Jefferson, N. H., 254.
- Slides, Tripyramid, of 1885, 177, 276.
- SOCIAL MEETINGS, 155, 169, 362.
- Società degli Alpinisti Tridentini, photographs of the Tyrolean Alps, 88, 156.
- Sourdnhunk Mountains, an autumn visit to, 20.
- Speckled Mountain, 71, 90, 261.
- STONE, Miss M. I. Mt. Watnomie and the Blue Ridge, 75, 90; path to Georgianna Falls, 84.
- STONE, W. H. Flora of Mt. Monadnock, 145.
- Subscriptions, for sufferers in Piedmont, 171, 246, 273; for monument to De Saussure, 278, 375, 376.
- Summer School of Geodesy and Topography, 376.
- Summit House, Mt. Washington, N. H., field meeting at, 378.

## T.

- Table of altitudes in Mass., 139, 144.
- TALBOT, Miss M. Trip to Norway and the North Cape, 383.
- Teneriffe, ascent of the peak of, 378.
- Thanks, to Società degli Alpinisti Tridentini, 88; to Mrs. E. A. Lane, 169; to Miss S. M. Barstow, 378; to Miss H. L. Brown, 378.
- Topography, report of councillor of, 92, 163, 256, 275, 382.
- Treasurer, report of, for 1884, 161; for 1885, 251.
- Tripyramid Slides of 1885, 177, 276.
- Tuckerman's Ravine, winter excursion to, 124, 173, 377; slide in, in August, 1885, 378.
- Turkey Hill, excursion to, 87, 92.

## U.

- U. S. Geological Survey, Bulletin of, 62; map of Williamstown and Greylock, Mass., 379.
- Utah, 170.

## V.

- Vesuvius, ascent of, 170.
- Virginia, Appalachian region in, 173.
- Votes passed, 87, 91, 92, 169, 276, 277, 377, 378, 380, 382.

W.

- WALLING, H. F. Town boundaries, 171.  
 Webster's Baltimore and its neighborhood, 59.  
 West Humboldt Mountains, 151.  
 White Mountain region, map of, 163, 256.  
 White Mountains, heights of, 305; odometer measurements in, 351.  
 WHITE, Mr. and Mrs. T. E. M. Present photographs, 383.  
 WHITTIER, J. G. Letter from, 373.  
 Wild River, region east of, 261.  
 Williamstown, Alpine Club of, 45, 92; and Greylock, map of, 379.  
 Willoughby Notch, 64.  
 Winnipeg country, 375.  
 WINSHIP, A. E. Colorado, New Mexico, and Utah, 170.

- Winsor House, Elizabethtown, N. Y., meeting at, 379.  
 WITHERLE, G. H. Autumn visit to Sourd-nahunk Mountains and Katahdin, 20.  
 WORCESTER, J. Report of councillor of art, 69; Humphrey's Ledge and its view, 130; views of White Mountain scenery, 377, 383.  
 WRIGHT, E. Middlesex Fells, 174.

Y.

- YOUNG, C. A. Decennial celebration of A. M. C., 369.

Z.

- Zinal Rothhorn, ascent of, 97, 174.



**PUBLICATIONS**  
**OF THE**  
**APPALACHIAN MOUNTAIN CLUB.**

---

**Appalachia:** The Journal of the Appalachian Mountain Club. With many illustrations and maps. Vols. I-IV. 1876-1886. 8°. Vol. I., \$3.00, bound; Vols. II-IV., each, \$2.50, bound. Subscription, 50 cents a number. Issued usually twice a year.

**Middlesex Fells.** With a map. By R. B. LAWRENCE. 1886. 8°. 25 cents.

**Preliminary Charts of the Positions of White Mountain Summits.**  
Scale 1:50000. 1886. Two sheets of blue prints. \$1.30.

**Map of Williamstown and Greylock,** executed by the U. S. Geological Survey. Scale 1:30000. 1886. 30 cents.

**Register.** 1879-1886. 8 numbers. Long 24°. (Distributed to members.)



